Heating Piping & Air Conditioning

MARCH 1955

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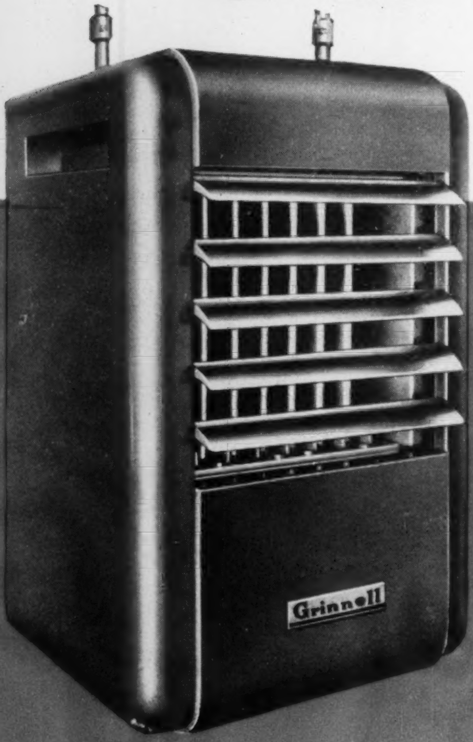
INDUSTRIAL • COMMERCIAL • INSTITUTIONAL • PUBLIC BUILDINGS

Journal Section of the American Society of Heating and Air-Conditioning Engineers—p. 147

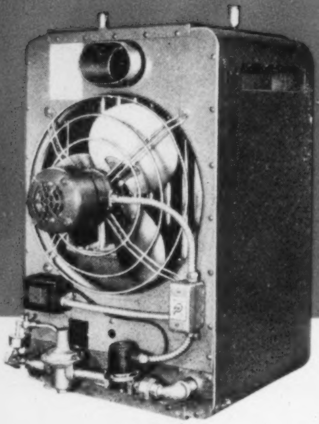
NORTHBOUND EXIT
SOUTHBOUND EXIT

Ramp snow melting and extensive ventilation serve the world's largest underground garage ....Page 105

GRINNELL GAS-FIRED UNIT HEATERS



Available in 7 sizes — with input ratings from 25,000 to 200,000 Btu's.



All parts readily accessible for periodic servicing.

This Grinnell unit heater—burning all types of gases—is built to provide efficient, dependable service even under severe conditions. Typical of the interiors for which this gas-fired unit heater assures clean, constant heat are: factories, repair shops, garages, warehouses, stores and supermarkets.

- **efficient performance:** Assured by modern design of burners and heat exchanger, proper motor and fan unit.
- **effective air distribution:** Motor and fan unit delivers maximum air volume at maximum efficiency with minimum noise; louvers are individually adjustable.
- **instantaneous heat:** Full rated capacity obtained in 18 seconds from a cold start.
- **no danger of gas escaping:** Automatic safety pilot operates to shut off gas supply if pilot burner goes out.
- **no flashback, no extinction noise:** Prevented by the burners' raised port design and proper port size for the particular gas used.
- **overload protection:** The low speed motors have built-in thermal overload protection and automatic reset.
- **summer air circulation:** Summer-winter switch permits use of fan for air circulation during warm weather.
- **easy suspension:** Threaded pipe hangers are integral parts of the heater.
- **complete wiring:** Unit requires only connection to suitable room thermostat or manual switch.
- **easy maintenance:** All parts are readily accessible for periodic servicing; hinged bottom pan permits cleaning interior of tubes; burners and control assembly are removable as a unit.
- **durable construction and finish:** Housing die-formed of heavy, stretcher-level steel and finished with heat resistant, baked-on enamel; combustion chamber of heavy steel, welded; tubes and draft diverter of aluminized steel; burners of close-grained iron castings.

Approved by the American Gas Association and listed by Underwriters' Laboratories, Inc.

GRINNELL

UNIT HEATERS FOR STEAM, HOT WATER, GAS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports
Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

Solve exhaust and ventilating problems quickly and easily...

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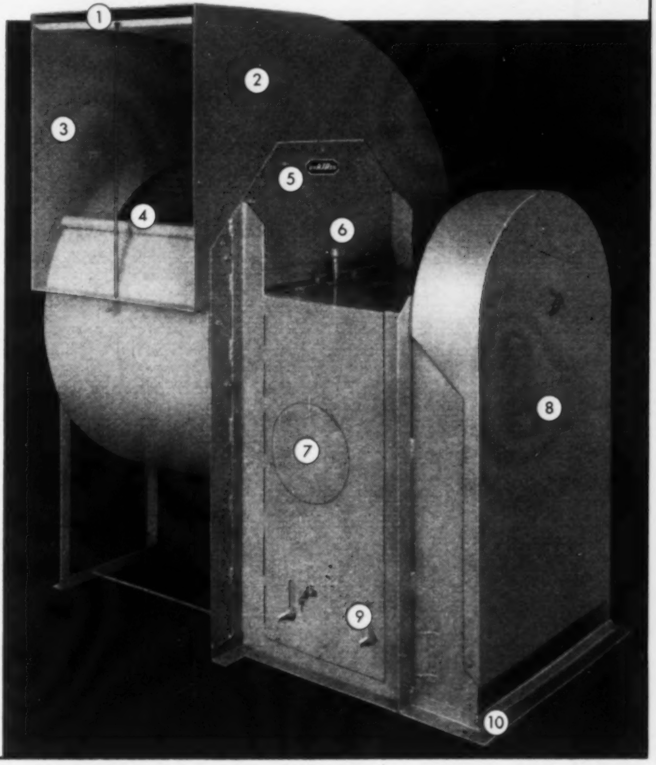
Type CH HOUSED VENTILATING SETS now stocked in popular sizes for immediate shipment!

usAIRco Type CH Housed Ventilating Sets are designed for efficient, economical commercial and industrial ventilation applications, such as hotels, office buildings, factories, etc. The compact, streamlined design makes the units adaptable to inside or outside installation. No additional weather protection is required.

1. **Vari-Flo Control**—Simple adjustment controls air volume.
2. **Heavy Gauge Arc Welded Scroll Housing**—Continuous welding of blower scrolls and sides assure rigid, airtight construction.
3. **Sleeve Type Inlet and Outlet**—Inlet ring for sleeve type inlet connection to ventilation duct. Blower outlet is sleeve type for simple duct connection.
4. **Multi-Blade Impeller**—Forwardly curved blade wheel of rigid construction produces large volumes of air at relatively low tip speeds for quiet operation. Removable without disturbing attached ductwork. Wheels tested and balanced for smooth blower operation.
5. **Universal Discharge**—Blower discharge can be set in 8 positions. Position easily changed on job.
6. **Exposed Oil Cups**—For easy lubrication of blower bearings.
7. **Access Door**—Permits easy lubrication of motor and servicing of blower bearings.
8. **Accessible Drive**—Belt guard easily removed for access to driving sheaves and belts.
9. **Adjustable Motor Mount**—Hinged, adjustable mount permits easy belt tension adjustments . . . is vibration-free.
10. **Rigid Frame Construction**—Blower framing has rigid, structural angles, heavy gauge sheet steel panels.



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Will-Burt Automatic, Air-Controlled Stokers assure complete, efficient combustion, not only during operating periods, but during the critical "off" periods as well.

Fuel buyers *get* the Btu's they pay for when it's a Will-Burt Stoker on the job.

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WILL-BURT STOKERS

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Write for manual on stoker-heating, showing suggested specifications and installation diagrams.

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Heating Piping & Air Conditioning

Vol. 27 No. 3

(with which is merged the Aerologist)

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AND MAINTENANCE IN
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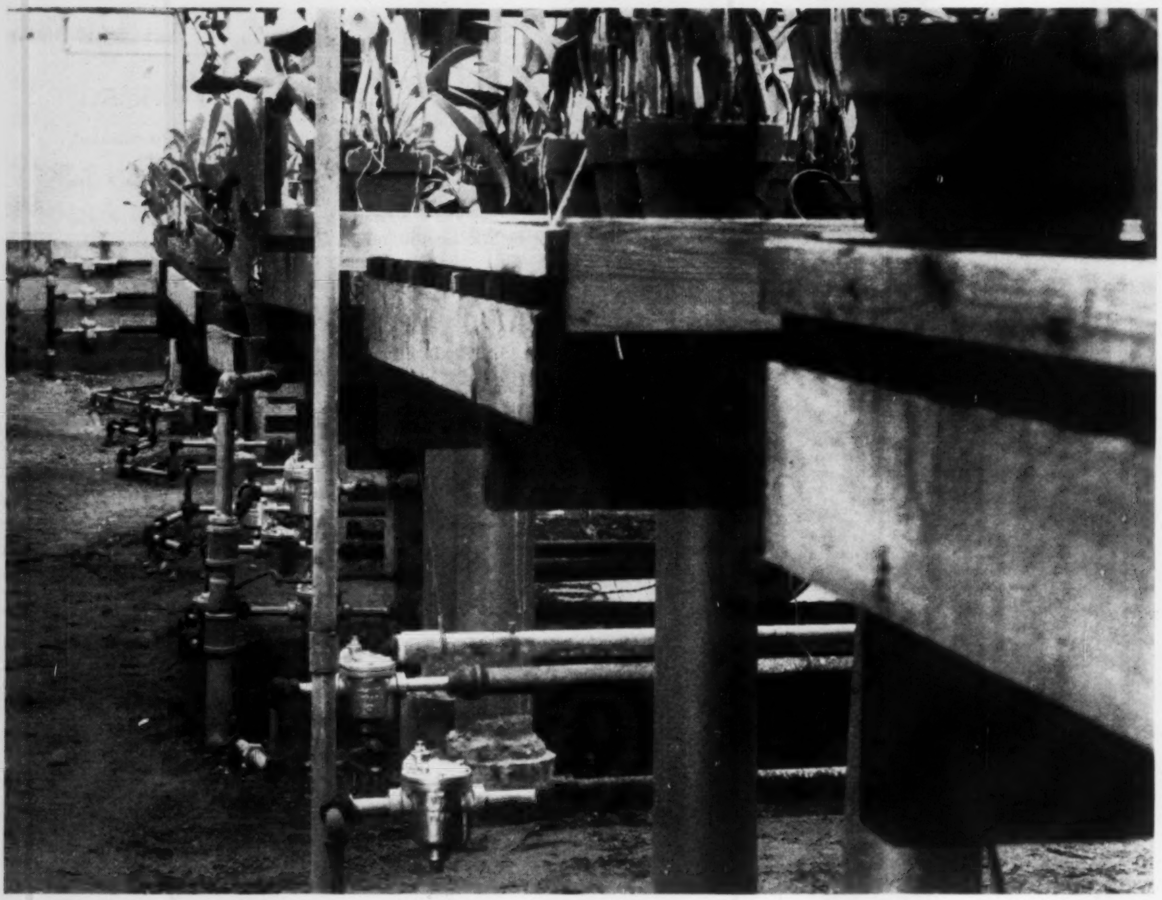

"No trouble holding vacuum with these traps"

"They certainly are an easy trap to maintain. We haven't done a thing to them yet—and no more trouble holding vacuum", says Joseph Vermuelen, Floral Avenue Greenhouses, Mt. Clemens, Mich.

Dozens of Armstrong "blast" traps are used at this greenhouse to drain heating coils operating at 2 to 10 lbs. pressure with a 10″ vacuum return.

Armstrong traps are especially desirable for low pressure vacuum return systems because of their durability and long service without leakage. (It's the leaky traps that make you lose vacuum.)

There is nothing in an Armstrong trap to rupture. The bucket is open. Every trap is factory tested at 500 lbs. water pressure. Hardened chrome steel valve and seat . . . stainless steel bucket and lever assembly—the same design, materials and workmanship used in Armstrong traps for power plant service at 900 lbs. pressure, 900 degrees temperature! It's no wonder they last for years without repairs in low pressure vacuum return service. Don't ever let anyone tell you the Armstrong inverted bucket trap isn't good for this service. It's best! There's proof galore. Ask your Armstrong Representative for the facts, or write:

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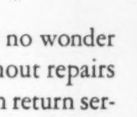

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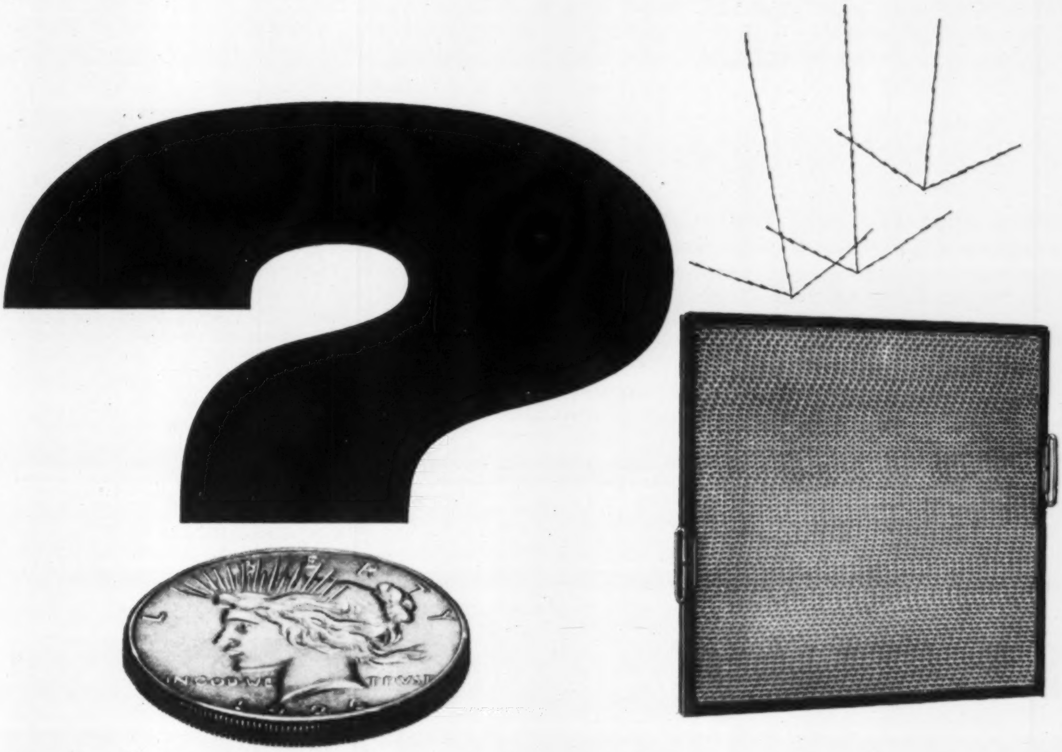

HOW MUCH DO YOUR SAVINGS COST?

With the high cost of building today, it's natural to cut corners wherever practical. But there's one step where it doesn't pay to save . . . and that's in the selection of air filters.

When it costs thousands of dollars to install an air conditioning system—why take a chance on the effectiveness of the job by installing ordinary filters because they cost a little less?

Consider the economics. About $200.00 invested in filters generally suffices for the average office building, church, school, etc., budgeted at $200,000.00 . . . less than 1/10 of 1%! For a few dollars more you can buy the right type Far-Air filter to fit the job and be sure of **cleaner** air, **longer** service life and **lower** maintenance costs **for many years.**

Farr field engineers will be glad to study your air cleaning problems and make specific recommendations.

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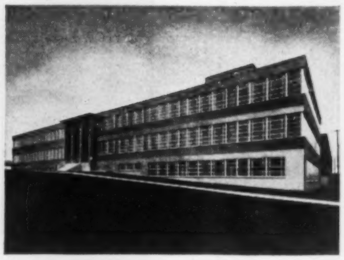

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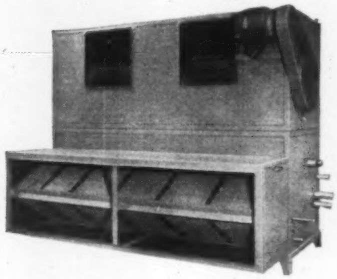

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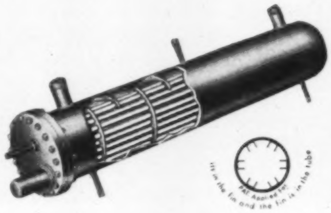

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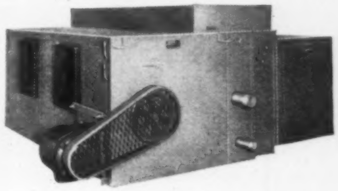

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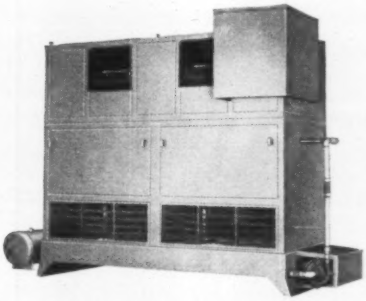

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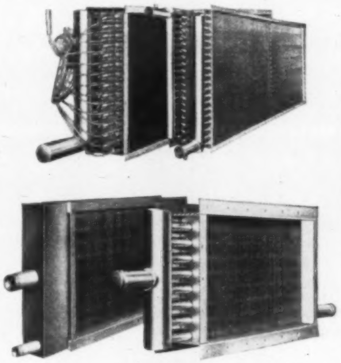
Model EK. 3, 5, 7½, 10 & 15 tons.



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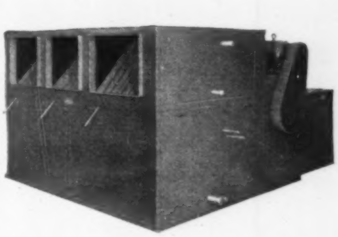

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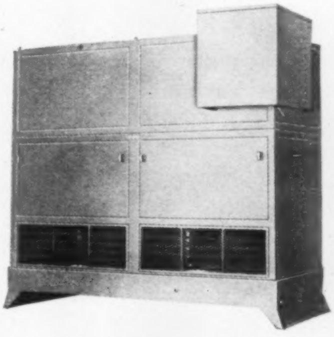

COOLING TOWERS

Outdoor-Indoor.
Model CT. 15 to 75 tons.

COOLING TOWERS

Outdoor-Indoor in stock. Model KT. 5 sizes, 3 to 16 tons.

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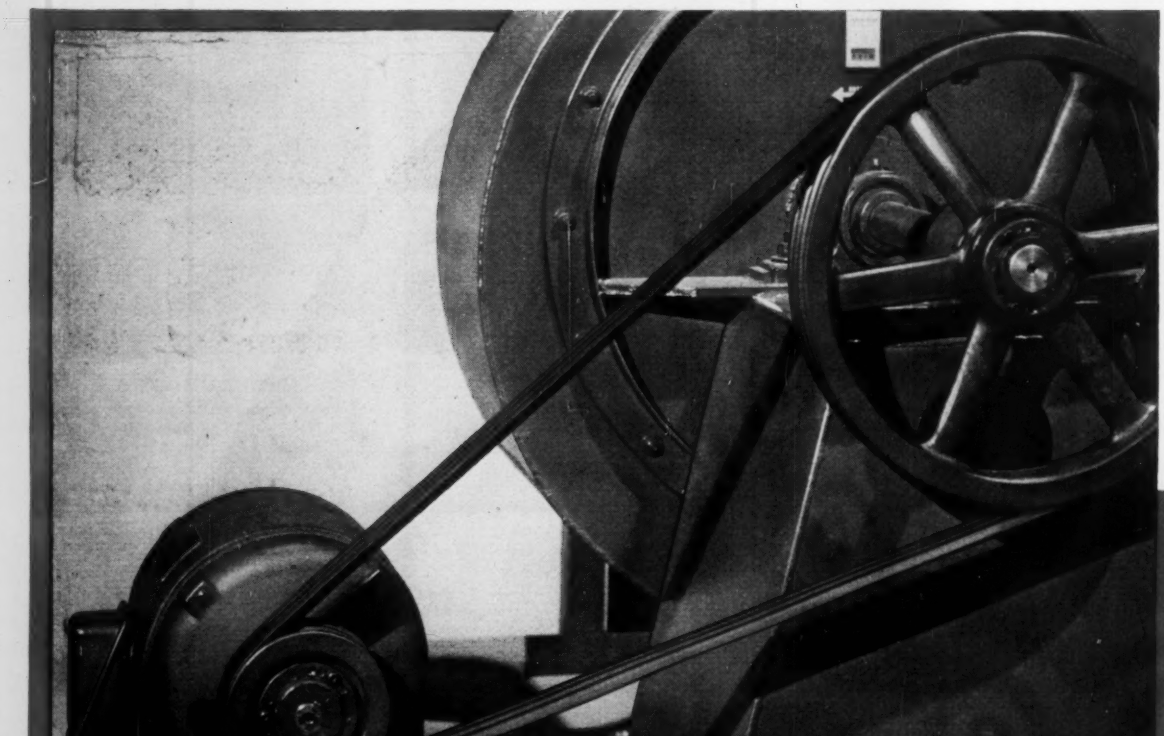

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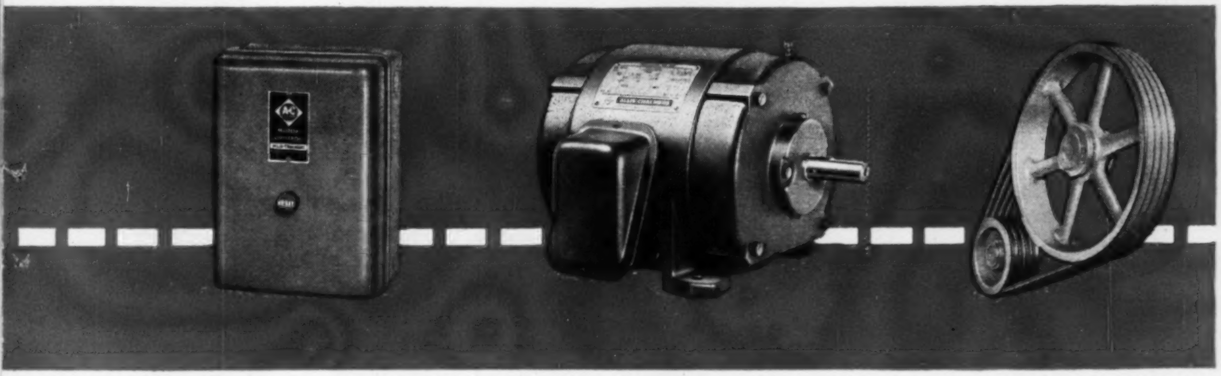

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These Components are Designed to Work Together and They're Backed by Nation-Wide Service

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AIR
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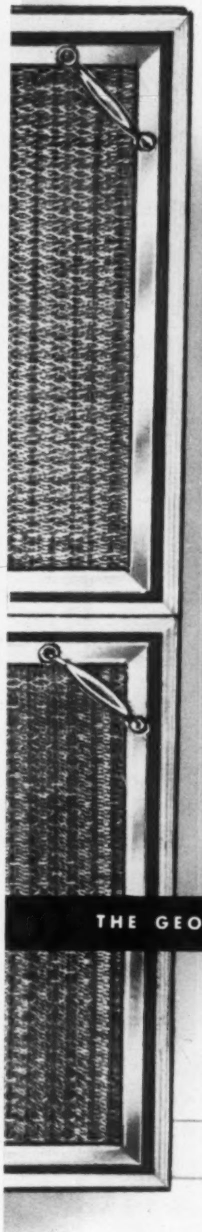

Creates new design opportunities with (1) AMAZING HIGH DUST HOLDING CAPACITY . . . that slows down the clogging action of lint and dust . . . at the same time provides a DOUBLE MARGIN OF SAFETY for today's costly, and highly sensitive forced air equipment. (2) Allows highest efficiency of air handling equipment for a lifetime. (3) Gives SURER PROTECTION for a lifetime.

NEW . . . MORE FILTERING ACTION PER SQUARE INCH

Precision stamped and angled openings of grid pact set up super high turbulence. Cause air to travel 3.5 times filter depth from inlet to outlet side . . . force it over 1.24 miles of burred, talon like edges in a 20″ x 20″ x 2″ size filter.

NEW . . . MORE DUST CAPACITY PER SQUARE INCH

Large precision cut openings on inlet side hold lint without stopping air flow. Minimize matting. Utilize filter depth. Give filter 200% greater dust holding capacity . . . without harmful resistance to air flow.

NEW . . . MORE STRENGTH, RIGIDITY PER SQUARE INCH

Frames made of extruded aluminum. Designed to hold true dimensions and alignment under heaviest stress . . . yet filters are so light and easy to carry that time and labor costs are cut to a minimum on every installation.

NOTE: The precision stamped grid pacts are so strong they will withstand an 1 and ⅛″ stream of water under 65 lbs. pressure (at 300 gallons per minute).

NEW . . . CLEAN IN ORDINARY ROOM WITH TAP WATER

No special facilities or costly cleaning equipment required. No dripping oil. No mess. Recoat an Evans filter simply by a light spray of filter fluid. Filter does not require dipping, immersion, or draining . . . nor standby filters.

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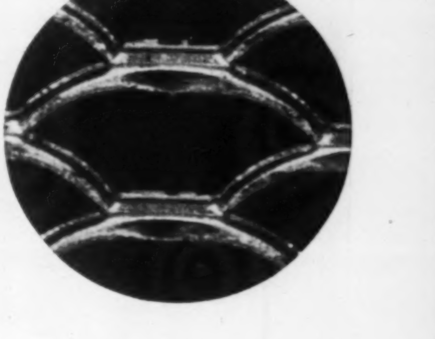

Blowup of Evans grid showing precision cut openings with thousands of burred talons for clutching and holding dirt.

THE GEORGE EVANS CORPORATION MOLINE - ILLINOIS

Gentlemen: Please rush me complete free information on the new EVANS HIGH CAPACITY FILTER . . . THAT brings a revolutionary new concept to air filtering.

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Company

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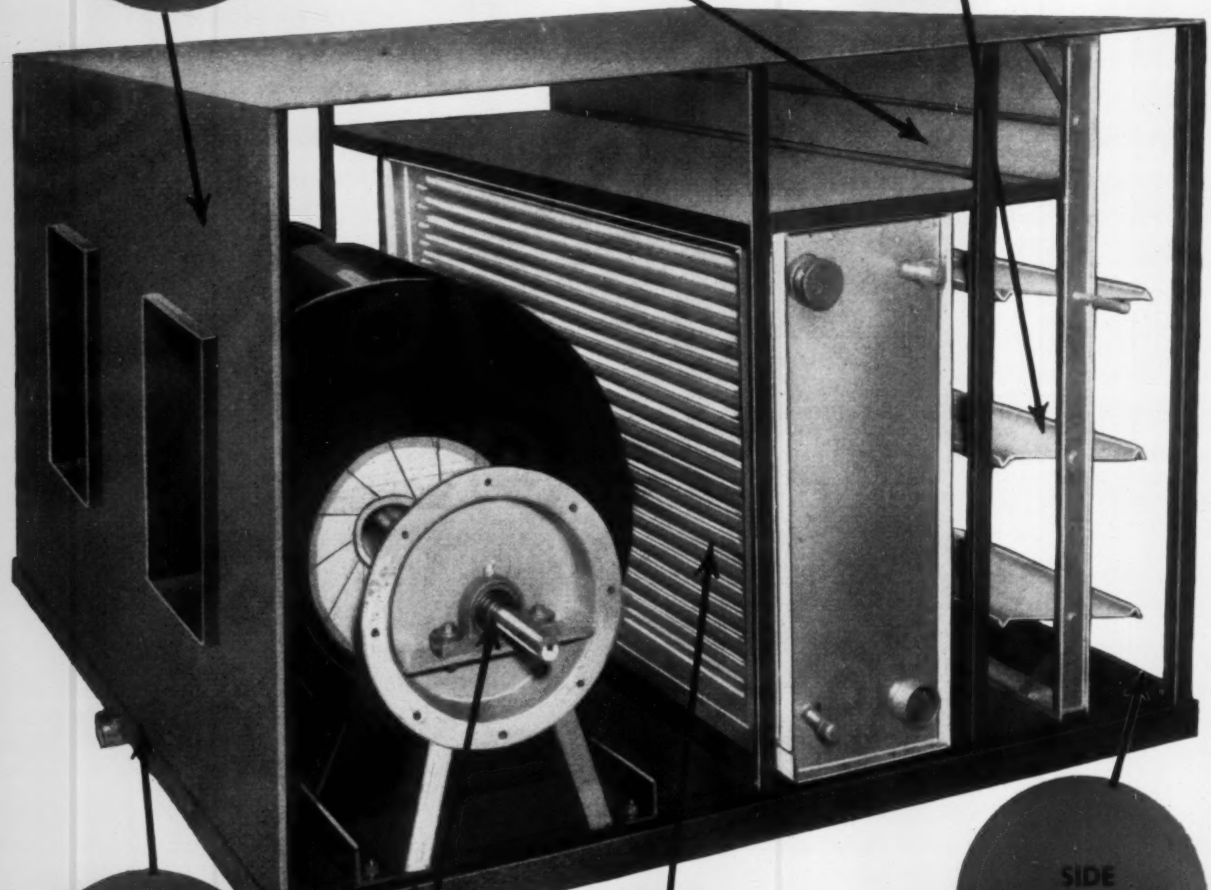
for long life. Insulated inside.

BY-PASS DAMPER

FACE DAMPERS
(available with automatic controls)



PAN
has neat, flat bottom. Extra heavy welded steel plate. Insulated to prevent condensation

EASY LUBRICATION
of fan bearing from outside. External bearing bowl.

TROUBLE-FREE AEROFIN COILS
mean long life and simple maintenance.

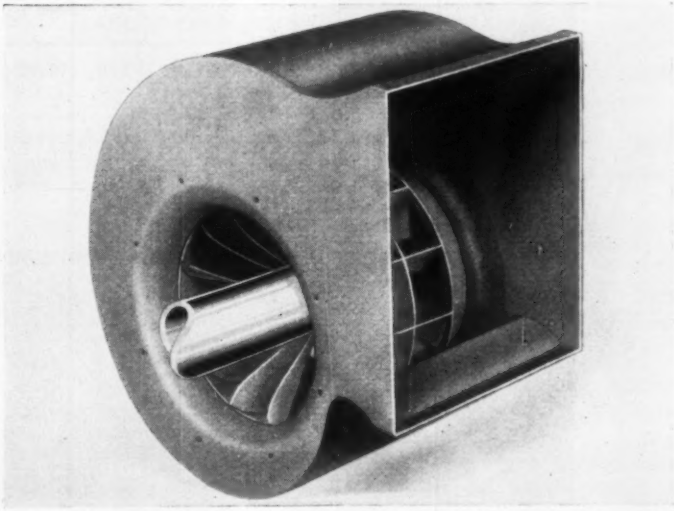
EFFICIENT HUMIDIFIERS
in either non-clogging spray nozzle type or all-copper pan type with float valve.

SIDE PANELS REMOVABLE

CABINETS ARE BUILT TO STAY SOLD!

This view of a "Buffalo" PC Cabinet (with side panels removed) shows why these units give *lasting satisfaction on the job*. It's part of what we call the "Buffalo" "Q" Factor*. From filter box to outlet, construction is both heavy-duty and convenient for maintenance. You'll like their ease of installation, too — this horizontal PC Cabinet can be placed directly on the floor or suspended. And where space is short, use "Buffalo" VPC Cabinets. These vertical models are in three demountable sections for moving in thru standard building openings. All models available with air washer sections, too, if desired. Capacities from 875 to 22,000 cfm. *Bulletin 3703A* gives full details. Write for your copy!

***The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*



STABLE, EFFICIENT, QUIET DELIVERY

with "Buffalo" mixed-flow fans — much more efficient than forward curve wheels and can be operated at higher pressures and speeds at lower noise level.

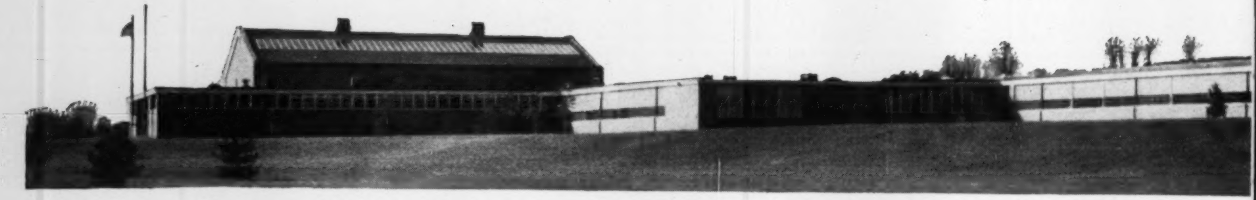
BUFFALO FORGE COMPANY
171 MORTIMER BUFFALO, N. Y.
PUBLISHERS OF "FAN ENGINEERING" HANDBOOK
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

"Buffalo"

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

Striking new school shows how to provide

Ideal indoor weather for your most modern



Why Honeywell Customized Temperature Control is a "must" in modern buildings

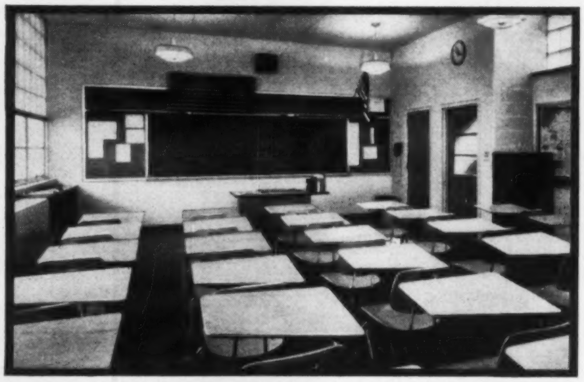
Providing modern comfort in a genuinely modern building presents no real difficulty if you approach your problem with genuinely modern control thinking—Honeywell Customized Temperature Control.

Take the case of the Cumberland Valley Joint High School, the Pennsylvania school that was picked as one of the twelve best designed and engineered schools in the U.S. last year.

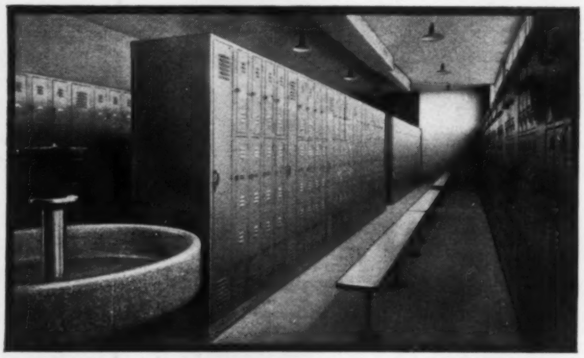
Strategically placed Honeywell thermostats (see floor plan) compensate for every possible occupancy, exposure and use comfort factor. In doing so, they help make students more alert—and make possible better learning.

The *techniques* used in the Cumberland school can help you provide the Indoor Weather required for your clients' facilities—for a Honeywell Customized Temperature Control installation is *designed to fit the needs of the building and its occupants.* This applies not only to heating and cooling, ventilating and humidity control, but to industrial control as well.

Only Honeywell can provide true "customized" control. Because only Honeywell manufactures all three types of controls—electronic, pneumatic and electric.

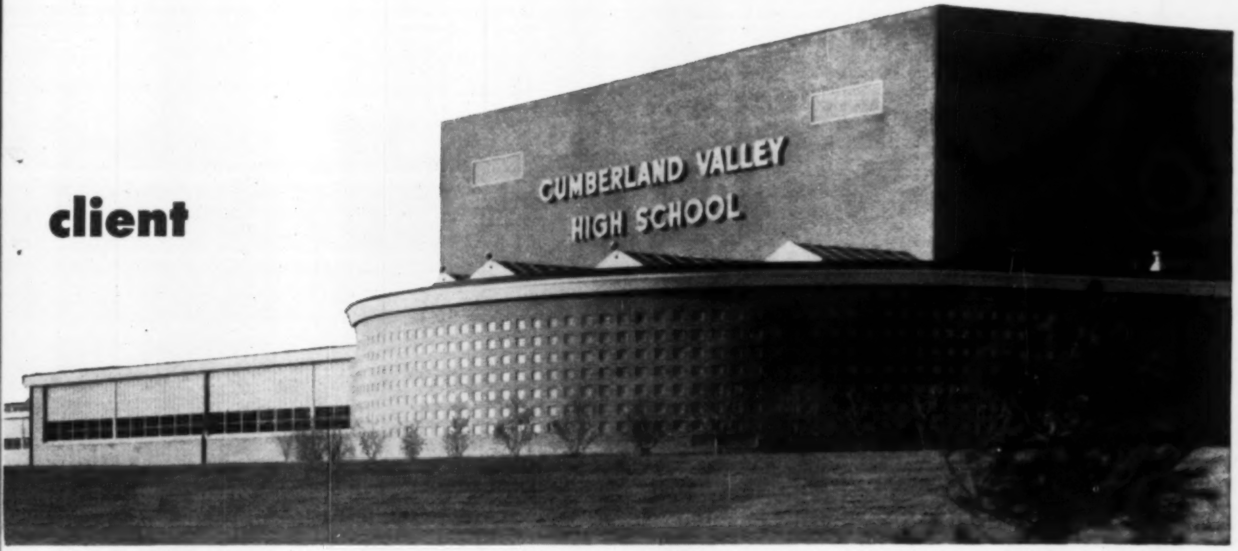


Exposure and occupancy comfort factors are the big control problems in classrooms where the aim is to keep children attentive. The generous use of glass makes the heating load vary greatly because solar radiation varies. How many students are in a room—and this varies, too—is quite important in determining the heating load. But with a thermostat in each classroom, control is precise—and students and teachers are always alert.

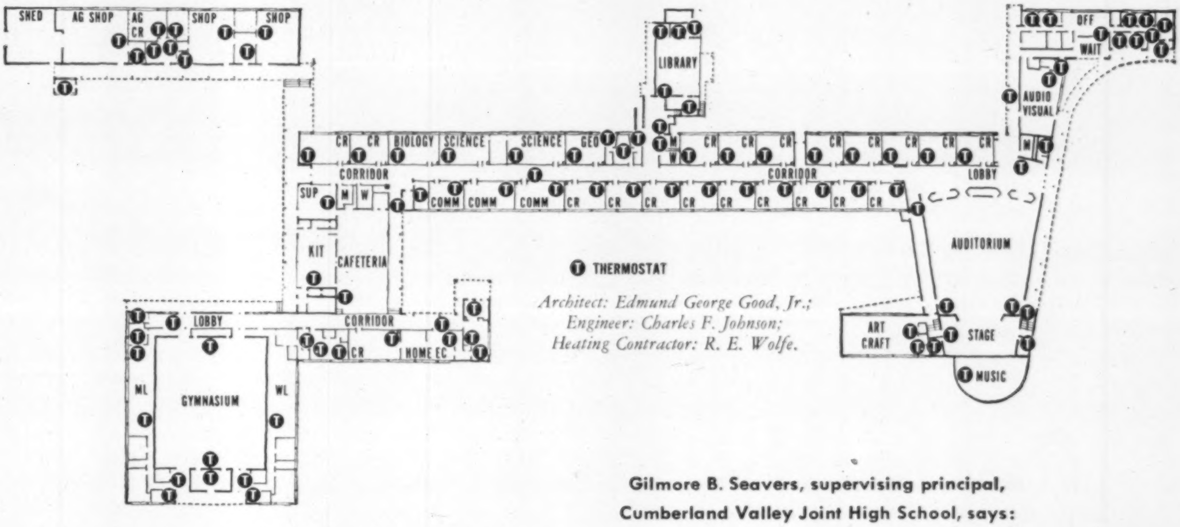


The "use" factor is the biggest problem in locker rooms. The heating-ventilating load shifts abruptly with the in-rush or exit of students. Thermostats easily meet this problem here, as well as variants of the "use" problem found in the school's gym, auditorium and cafeteria.

client


CUMBERLAND VALLEY
HIGH SCHOOL

"Rambler" construction of Cumberland Valley Joint High School dramatically demonstrates need for Honeywell Customized Temperature Control.


SHED
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HOME EC
ART CRAFT
STAGE
MUSIC
ML
GYMNASIUM
WL

Architect: Edmund George Good, Jr.; Engineer: Charles F. Johnson; Heating Contractor: R. E. Wolfe.

For comfortable, more productive temperature in new or existing buildings – of any size – specify Honeywell Customized Temperature Control

Whether it's a school, office, motel, hospital, factory—any building of any size—new or existing, Honeywell Customized Temperature Control can help meet your clients' heating, ventilating, air conditioning and industrial control problems.

You can give your clients more comfort and efficiency, and they'll save fuel, too.

For full facts on Honeywell Customized Temperature Control, and the economical Honeywell Periodic Maintenance Plan, call your local Honeywell office. Or write Honeywell, Dept. HA-3-29, Minneapolis 8, Minnesota.

Gilmore B. Seavers, supervising principal, Cumberland Valley Joint High School, says:

"It is our point of view that the thermal environment of a modern secondary school is a major factor in the interest of health, happiness and alertness of students and that the adequate and efficient control of a modern heating and ventilating system is therefore essential. Honeywell Customized Temperature Control has our sincere endorsement."

MINNEAPOLIS Honeywell

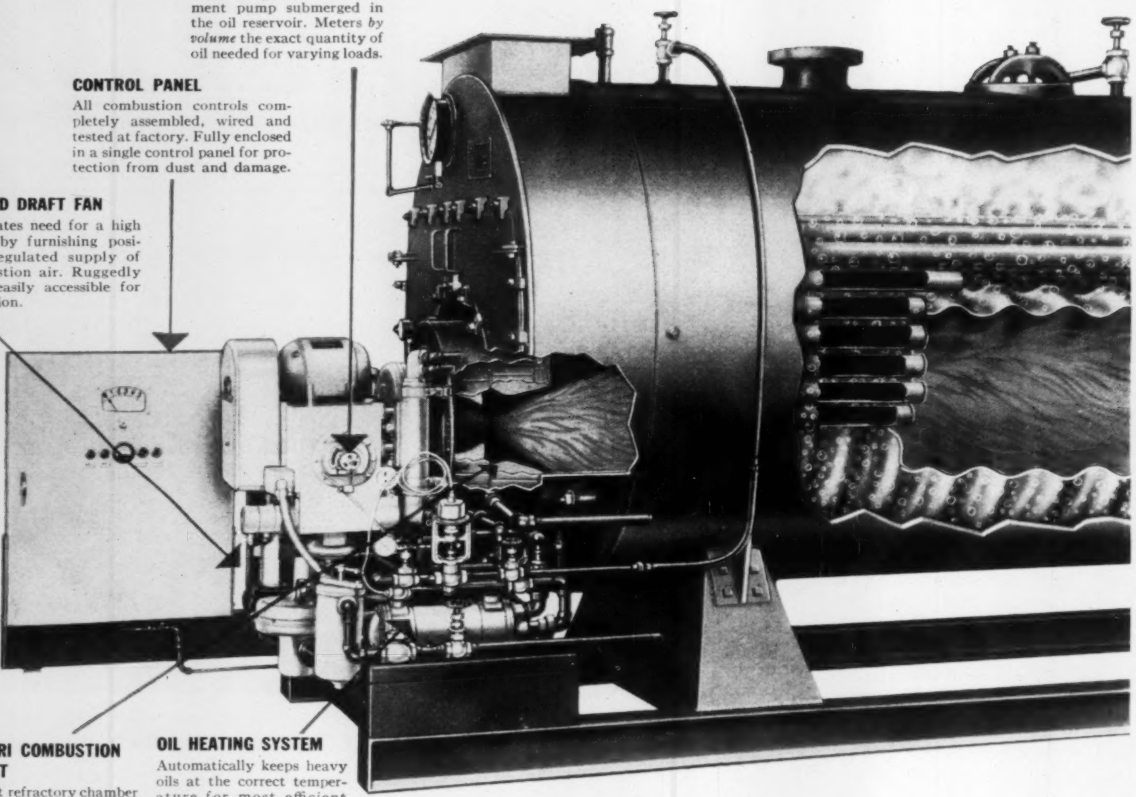
Customized Temperature Control

*112 offices across the **nation***

OIL VOLUMETER
Variable positive-displacement pump submerged in the oil reservoir. Meters *by volume* the exact quantity of oil needed for varying loads.

CONTROL PANEL
All combustion controls completely assembled, wired and tested at factory. Fully enclosed in a single control panel for protection from dust and damage.

FORCED DRAFT FAN
Eliminates need for a high stack, by furnishing positive, regulated supply of combustion air. Ruggedly built; easily accessible for inspection.



VENTURI COMBUSTION THROAT
Pre-cast refractory chamber is integral part of burner; eliminates on-the-job brick work.

OIL HEATING SYSTEM
Automatically keeps heavy oils at the correct temperature for most efficient combustion. Heater is tubular multiple-pass type; with temperature control instruments and necessary valves.

Perfectly balanced firing

IT HAS TO BE PLANNED

Iron Fireman firing systems are available as complete package boiler-burner units of the type shown above, or as separate package burners for installation in your present boilers.

No mere conversion burner, these package burner units contain every component for balanced firing: single or dual-fuel systems and burners, forced draft air supply, built-in combustion refractory, completely wired and tested controls.

Iron Fireman burner units are carefully assembled and tested at the factory. This means the kind of continuing dependability and operating efficiency seldom achieved with local assembly.

INSTALLATION SAVINGS, TOO

Long-range savings should be the main consideration in your choice of a firing system. But don't overlook the *installation savings* that you can also make with an Iron Fireman package burner. There's little more involved than bolting to the boiler front, and making fuel and electrical connections. Iron Fireman package burners are engineered for firing practically all types of steam and hot water boilers.

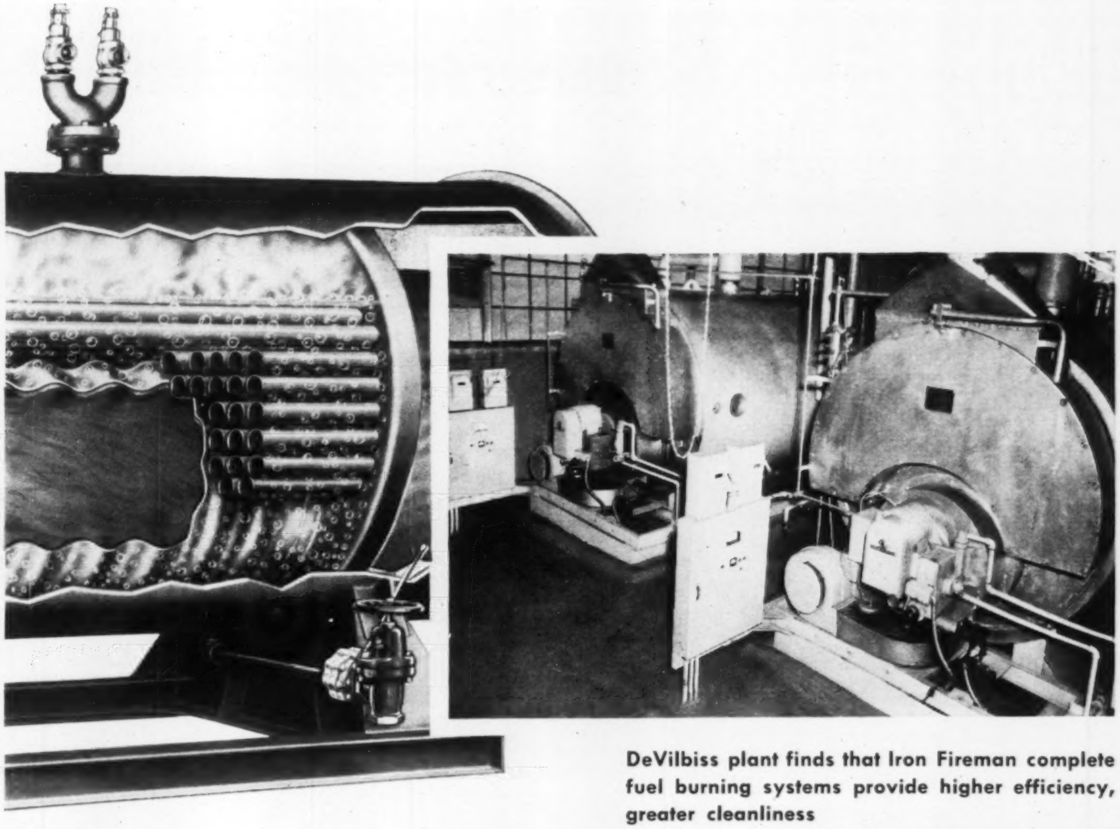
FOR OIL OR GAS, OR BOTH

Iron Fireman package burners with dual-fuel systems

THE IRON FIREMAN

Iron

OIL, GAS OR COAL



DeVilbiss plant finds that Iron Fireman complete fuel burning systems provide higher efficiency, greater cleanliness

This photograph of the DeVilbiss boiler room at Barrie, Ontario, Canada, shows two Iron Fireman boiler-burner combination units installed there last year. Officials report performance has been highly satisfactory. Installation was made by Tewes Engineering, Toronto, Ontario.

is no accident . . .

can bring greater economy to your operations in two important ways. First, you can take full advantage of seasonal fuel price cuts. And second, in event of emergency fuel shortages you can rapidly switch over *without* expensive shut-downs. Controls are actually changed from one fuel to another with just the flick of a switch!

Gas of any type is effectively burned with the Iron Fireman ring type gas burner. And the horizontal rotary oil burner, shown above, brings you steady and economical power with heat-rich heavy oils.

GET COMPLETE INFORMATION

Fuel savings . . . installation savings . . . dependable long-range operation. Certainly these features belong in *your* plant.

For complete technical information on the Iron Fireman package burner, send the coupon.

Fireman®

FIRING FOR HEATING, PROCESSING, POWER

IRON FIREMAN MANUFACTURING CO.
3059 West 106th Street, Cleveland 11, Ohio.
In Canada, write 80 Ward Street, Toronto, Ontario.

Please send detailed information on Iron Fireman package burner units for oil, gas, or oil-gas dual firing.

Name ______________________

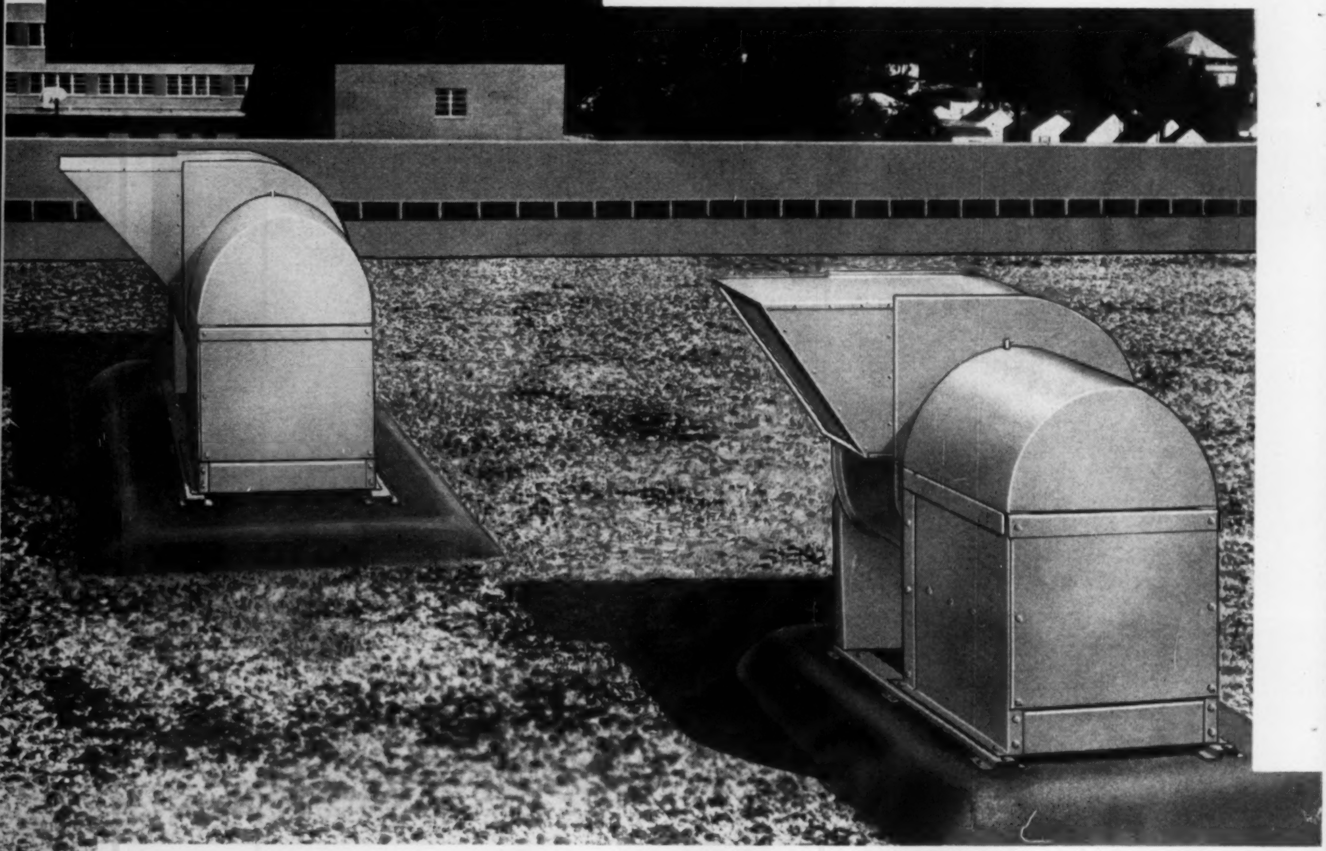
Address ______________________

City ______________ State ______

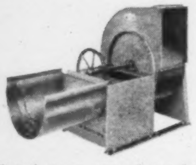
The New Advanced-Design

HERMAN NELSON
UNIT BLOWERS

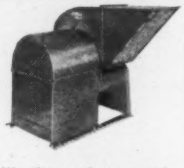
save *hours* of installation



only Herman Nelson offers all these features



Hinged cover opened to show new outboard sheave. World's easiest blower to service.



Weatherproof cover and belt guard offers perfect weather protection.

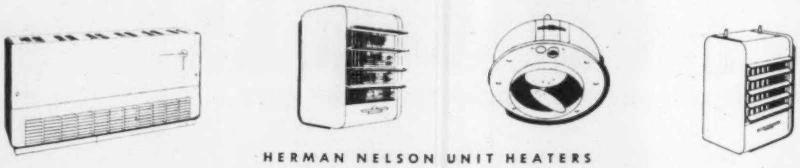
Adjustable motor mounting may be adjusted up or down, or side to side.

Heavy-duty Dodge SC ball bearings assure superior performance.

American Air Filter COMPANY, INC.

GENERAL OFFICES, LOUISVILLE (Ky.) • PLANTS IN LOUISVILLE, MOLINE (Ill.), MORRISON (Ill.), CHICAGO and MONTREAL (Canada)

A COMPLETE LINE
OF INDUSTRIAL HEATING
AND VENTILATING EQUIPMENT



HERMAN NELSON UNIT HEATERS

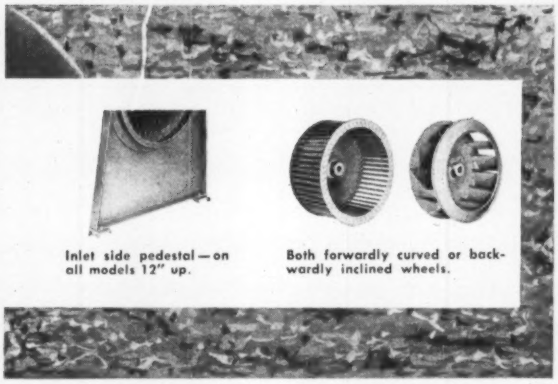
Better Air Is Our Business

...add *years* of service

Today's biggest news in packaged centrifugal fans . . . Herman Nelson's complete new line of Unit Blowers. Now, more than ever, you'll want to specify Herman Nelson Unit Blowers for every ventilating need. Important design changes make Herman Nelson *the world's easiest blower to install* —and also the easiest to service! Job costs go down—efficient performance gets a boost. Longer life, too, is assured.

Herman Nelson Unit Blowers offer you *both* wheel types in a wide range of unit sizes. Choose from capacities of 370 cfm to 25,000 cfm. There are models to handle supply and exhaust installations in schools, hospitals, stores, industrial plants, chemical laboratories—in fact, anywhere you have a blower application.

Before you install another unit blower, get all the information on the new advanced-design Herman Nelson line.



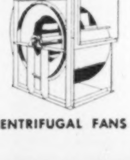
Inlet side pedestal—on all models 12" up.

Both forwardly curved or backwardly inclined wheels.

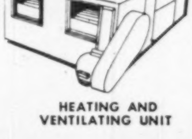
Now Ready!

New catalog on Herman Nelson Unit Blowers!

Send for your copy.



CENTRIFUGAL FANS



HEATING AND VENTILATING UNIT

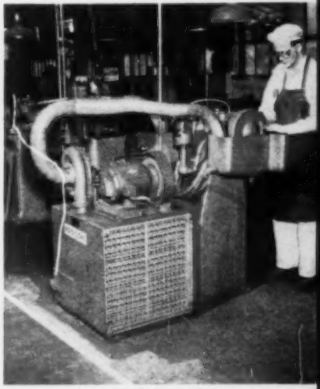
AAF

herman nelson

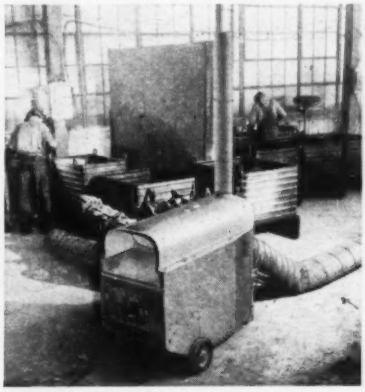
your one source for products

that clean, heat and move AIR

AAF **ELECTRO-CELL with Type H Washer** —high efficiency air cleaning with pushbutton maintenance—the washer as an integral part of the unit simplifies installation.



AAF **ROTO-CLONE Self-Contained Units** offer a simple solution for such isolated dust problems as this grinder stand. Exhaust air is filtered and returned to workroom.



herman nelson **PORTABLE HEATERS** being used to spot extra heat around workmen in a welding shop. Models available from 75,000 to 450,000 BTU. Oil or gasoline fired. Electric or gasoline powered.

illinois **ILLINOIS ENGINEERING STEAM SPECIALTIES** and power controls have been standards of the industry for more than 50 years. Illustrated above is float and thermostatic trap.

AMERICAN AIR FILTER COMPANY, INC.
373 Central Avenue, Louisville 8, Kentucky

Please send me complete information on the following equipment:

☐ UNIT BLOWERS
☐ UNIT HEATERS
☐ CENTRIFUGAL FANS
☐ ELECTRO-CELL AIR FILTERS
☐ DUST COLLECTORS
☐ PORTABLE HEATERS
☐ STEAM SPECIALTIES
☐ ____________

NAME ____________

FIRM NAME ____________ **POSITION** ____________

ADDRESS ____________

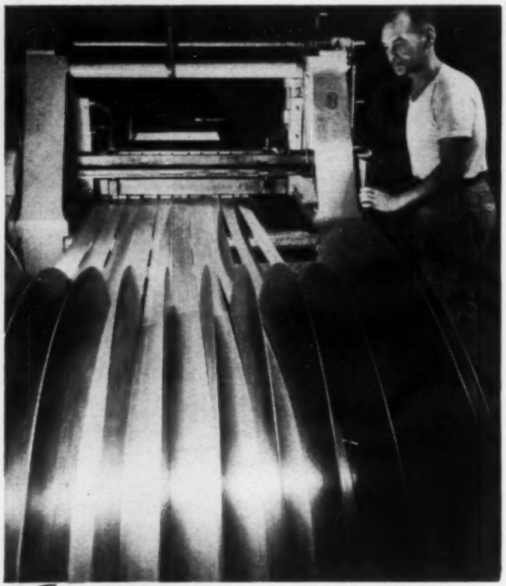
CITY ____________ **ZONE** ______ **STATE** ____________

Van Huffel Tube Corporation selects

USS Galvanized Steel Sheets

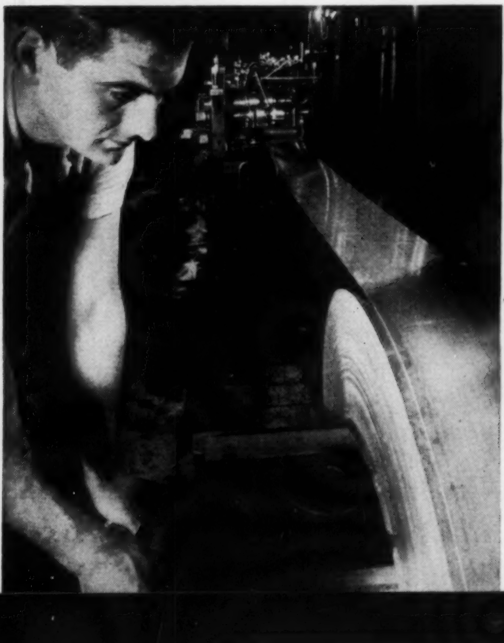
1

Coils of USS GALVANIZED STEEL SHEETS in multiple widths—as delivered to Van Huffel—ready to start their trip through some of the toughest forming operations imaginable.



2 Here USS GALVANIZED STEEL SHEETS pass through the first step of process. They're being slit into the proper widths for the sections into which they'll be formed.

First Stand. Strips of USS GALVANIZED STEEL SHEETS pass into first stand of the cold-forming operation. The cold-forming machines consist of a series of roll stands 3 —each with a special set of roller dies—through which strip is passed.



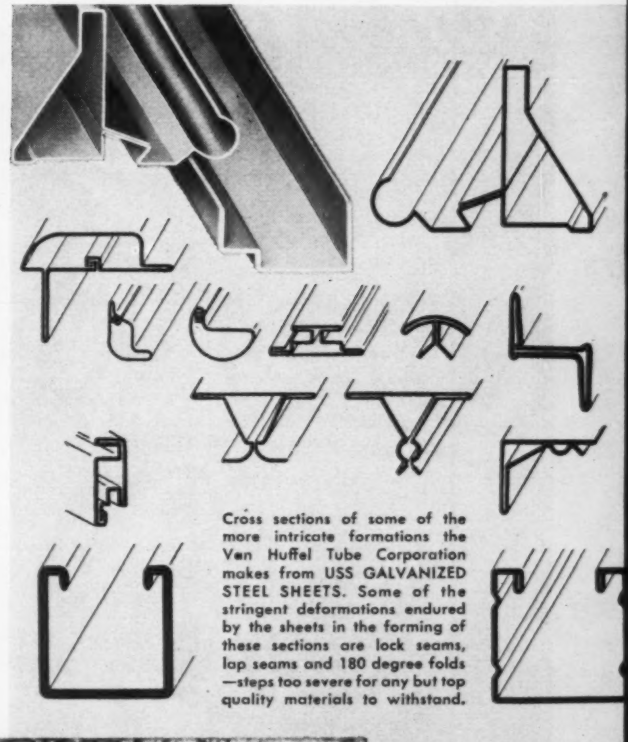
for severe and intricate forming operations

THE SLOGAN of this leading Warren, Ohio, manufacturer is: "Van Huffel—where ideas take shape—in metal." And, in manufacturing over 6000 different cold-formed shapes and tubing sizes, Van Huffel is really living up to its reputation. Because many of these shapes and tubes are of very complicated and severe design, it is imperative that they be formed from only top quality steel! That's why United States Steel is proud to be a supplier to Van Huffel Tube.

USS Galvanized Steel Sheets have outstanding qualities which make them especially valuable to Van Huffel, and to you. They have a tight, uniform zinc coating that will not flake or chip even under this severe bending or folding. They draw smoothly and evenly. And USS Galvanized Steel Sheets are uniform in gage, assuring a sound finished product. These qualities are of vital and equal importance in the difficult forming operations for which Van Huffel Tube is justly famous.

Perhaps there's a place in *your* operation for USS Galvanized Steel Sheets? If there is, take advantage of all the benefits of USS Galvanized Steel Sheets. For more information, ask your sheet distributor or our nearest district office. United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

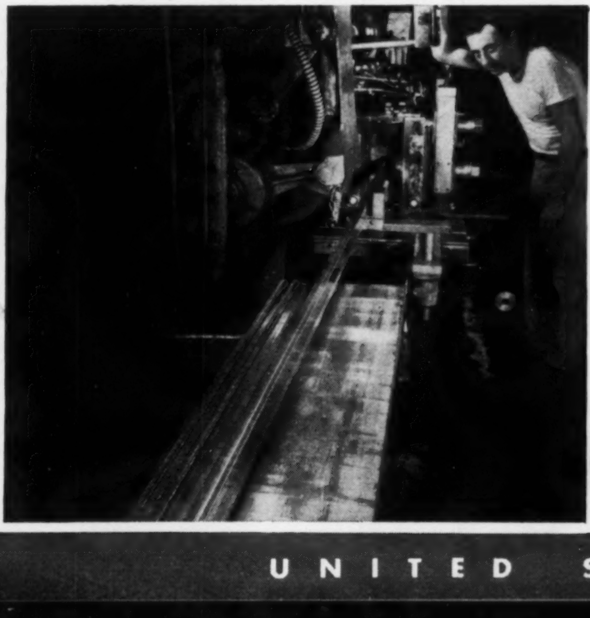
UNITED STATES STEEL CORPORATION, PITTSBURGH
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



Cross sections of some of the more intricate formations the Van Huffel Tube Corporation makes from USS GALVANIZED STEEL SHEETS. Some of the stringent deformations endured by the sheets in the forming of these sections are lock seams, lap seams and 180 degree folds—steps too severe for any but top quality materials to withstand.

Last Stand. Finished formed section emerges from last stand of operation, ready to be sheared to length and shipped. From the time the flat strip is fed into the first roll until the section is finished, the galvanized sheet undergoes a series of progressive deformations in the intermediate roll stands.

4

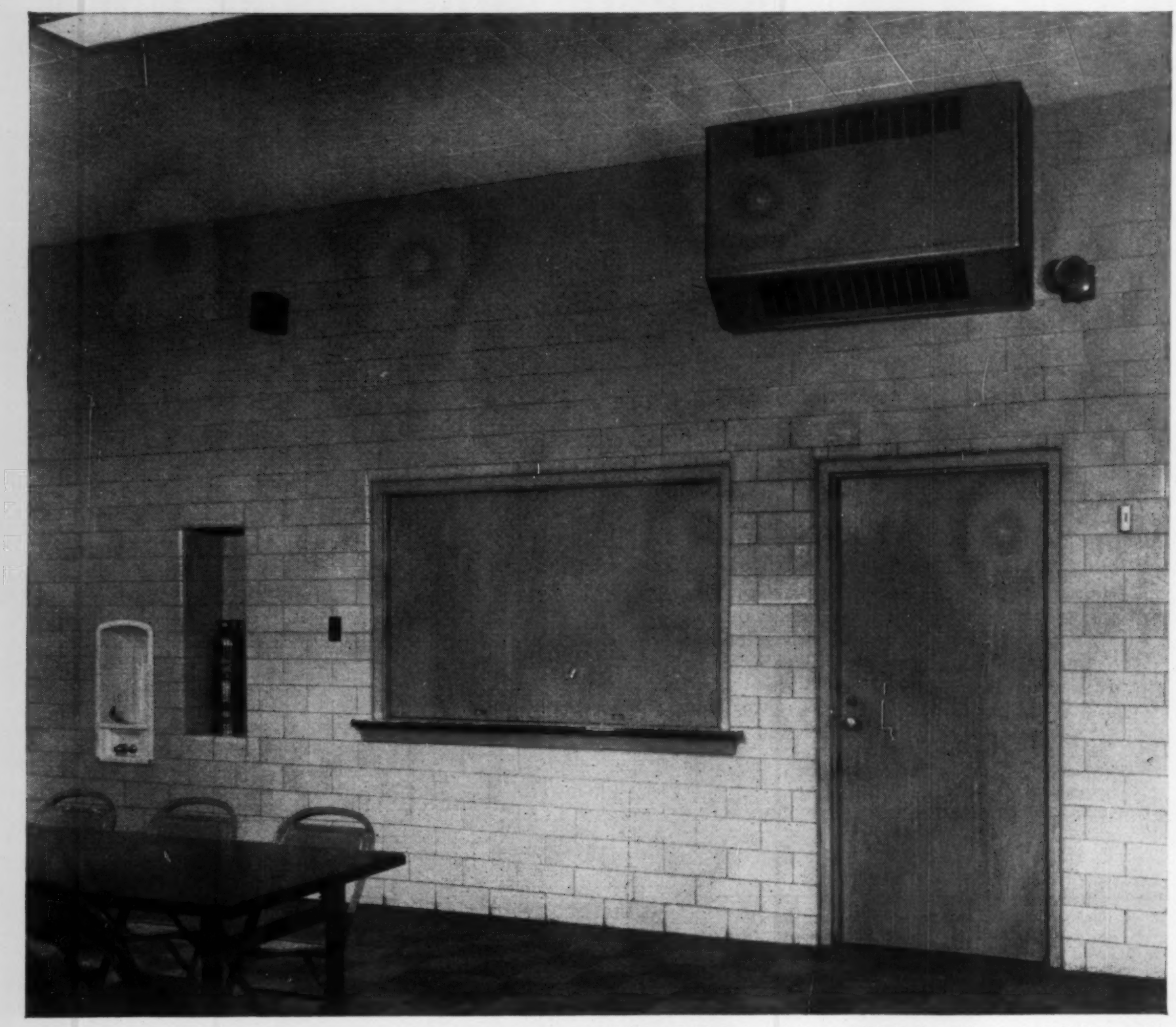


USS
STEEL
UNITED STATES STEEL
TRADE MARK

USS GALVANIZED STEEL SHEETS

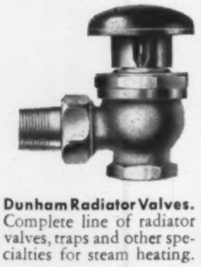
UNITED STATES STEEL

How to heat and cool with just

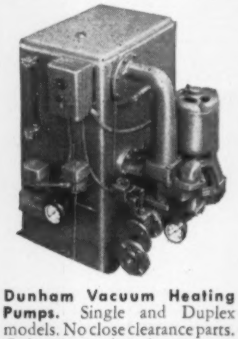


Dunham Vari-Temp Cabinet, inverted on wall of St. Bartholomew School, Chicago, Ill. Architect: Barry and Kay, Chicago. Heating Contractor: Northwestern Heating & Plumbing Co., Evanston, Ill.

From radiator traps
to fully engineered systems
you can DEPEND ON DUNHAM for
everything you need in heating

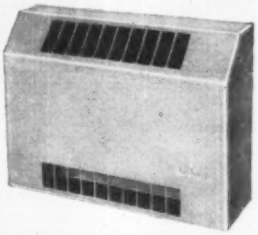


Dunham Radiator Valves. Complete line of radiator valves, traps and other specialties for steam heating.

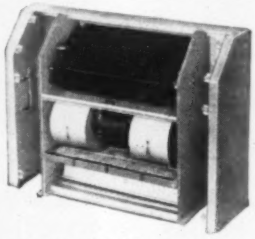


Dunham Vacuum Heating Pumps. Single and Duplex models. No close clearance parts. Only one moving element.

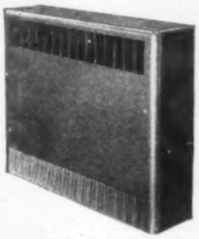
one unit...DUNHAM VARI-TEMP



Dunham Vari-Temp Heating-Cooling Cabinets—neat, compact units.



Interior view of Vari-Temp showing two blower fans, heating element damper and easily cleaned filter.



NEW DUNHAM CABINET UNIT HEATER. *Moderately priced cabinet unit heaters—for steam and hot water.*

Install Dunham all-weather Vari-Temp® and you have *more* than a heating system . . . *more* than a cooling system. You have *both* . . . and with *just one unit.*

Dunham Vari-Temp is a simple solution for your clients who want year-round air-conditioned comfort in their buildings, but can't afford costly space-using central system ductwork. Vari-Temp eliminates ducts since a single riser can supply hot water for heating, chilled water for cooling to each unit.

Individual room control. Dunham Vari-Temp Units heat, cool, ventilate, filter and dehumidify air on *room-by-room basis*—ideal for hotels, motels, hospitals, apartments, offices and other multi-room applications.

Versatile Vari-Temp not only heats and cools with water, but also heats with steam. Furthermore, you can mount this newly expanded line of comfort conditioning, double-duty cabinets on the floor, walls or ceiling . . . fully or partially recessed . . . or even completely conceal them.

For all the facts about versatile, all-weather Vari-Temp, write for Bulletin HPAC-3, C. A. Dunham Company, 400 W. Madison Street, Chicago 6, Illinois.

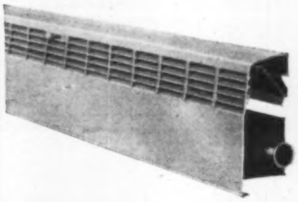
DUNHAM®

HEATING & COOLING EQUIPMENT

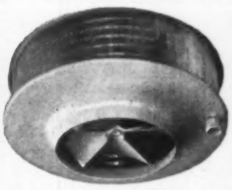
RADIATION • CONTROLS • UNIT HEATERS • PUMPS • SPECIALTIES

Quality First for Over Fifty Years

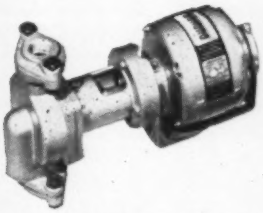
C. A. DUNHAM COMPANY • CHICAGO • TORONTO • LONDON



Dunham Radiation. Full range of sizes and types of convectors, baseboard and finned tube radiation.



Dunham Unit Heaters. Line includes heating-cooling units, vertical, horizontal discharge and large blower unit heaters.

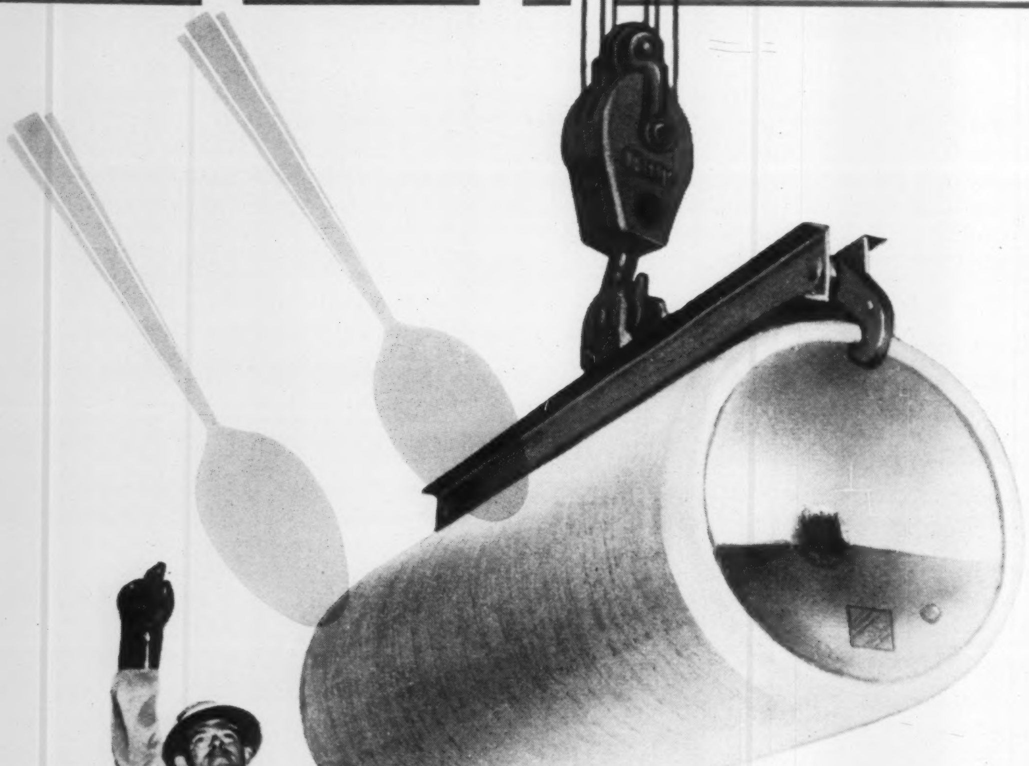


Dunham Circulators. Heart of Dunham's complete hot water line. Single-spring motor coupling. Brand-name motor.

DUNHAM
CONTROL PANEL

Dunham Vari-Vac®. Precision temperature control system uses continuous-flow "cool" steam, cuts fuel costs up to 40%.

LESS THAN 2 TEASPOONS



genetron 141—GREEN LABEL
MONOCHLORODIFLUOROMETHANE

Quality Specifications

Moisture wt. %, max.	0.0010
Chlorides	none
High boiling impurities—vol. %, max.	0.05
Non-condensable gases (gases insoluble in perchloroethylene)—vol. % in vapor phase, max.	5.0
Boiling pt. at 760 mm. Hg. °F	−41.4
Boiling range °F (to 85% pt.), max.	0.9

genetron 12—WHITE LABEL
DICHLORODIFLUOROMETHANE

Quality Specifications

Moisture wt. %, max.	0.0010
Chlorides	none
High boiling impurities—vol. %, max.	0.05
Non-condensable gases (gases insoluble in perchloroethylene)—vol. % in vapor phase, max.	1.5
Boiling pt. at 760 mm. Hg. °F max.	−21.4
Boiling range °F (to 85% pt.), max.	0.5

genetron 11—ORANGE LABEL
TRICHLOROMONOFLUOROMETHANE

Quality Specifications

Moisture wt. %, max.	0.0015
Chlorides	none
High boiling impurities—vol. %, max.	0.05
Boiling point at 760 mm. Hg. °F	74.7
Boiling range °F (to 85% pt.), max.	0.5

OF WATER IN ONE TON!

genetron®

Super-Dry Refrigerants

Two teaspoons of water aren't enough to cool your breakfast coffee or wet your whistle on a hot day . . . yet, that's the maximum amount of moisture ever found in a 2,000-lb. cylinder of "Genetron" Super-Dry Refrigerants. And, the amount in a single 145-lb. cylinder wouldn't even fog a man's glasses!

Actually, it takes the most delicate and accurate scientific apparatus to measure moisture in "Genetrons," for the content is so infinitely small that it must be expressed in parts per million.

For example, "Genetron" 12—White Label—and "Genetron" 141—Green Label—are so dry they contain less than 10 parts of water per million parts of refrigerant. That's moisture equal to only one/thousandth of one per cent (0.001%).

And, the overall purity of "Genetron" Super-Dry Refrigerants is equally good, for they are manufactured to meet quality standards which are in many respects more rigid than those for the purest research chemicals.

Look at the stringent manufacturing specifications listed here. See how low "Genetrons" also are in non-condensable gases and low boiling impurities. And, remember that the quality of current production consistently surpasses even these specifications.

It's easy to see why so many leading manufacturers have now chosen "Genetron" Super-Dry Refrigerants as the original charge for their equipment. Their tests have proved "Genetrons" meet every requirement for reliable refrigerants.

So—be sure—always use "Genetron" Super-Dry Refrigerants—made by General Chemical, America's foremost producer of high purity laboratory and scientific chemicals.

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Allied Chemical
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Basic Chemicals
for American Industry

GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

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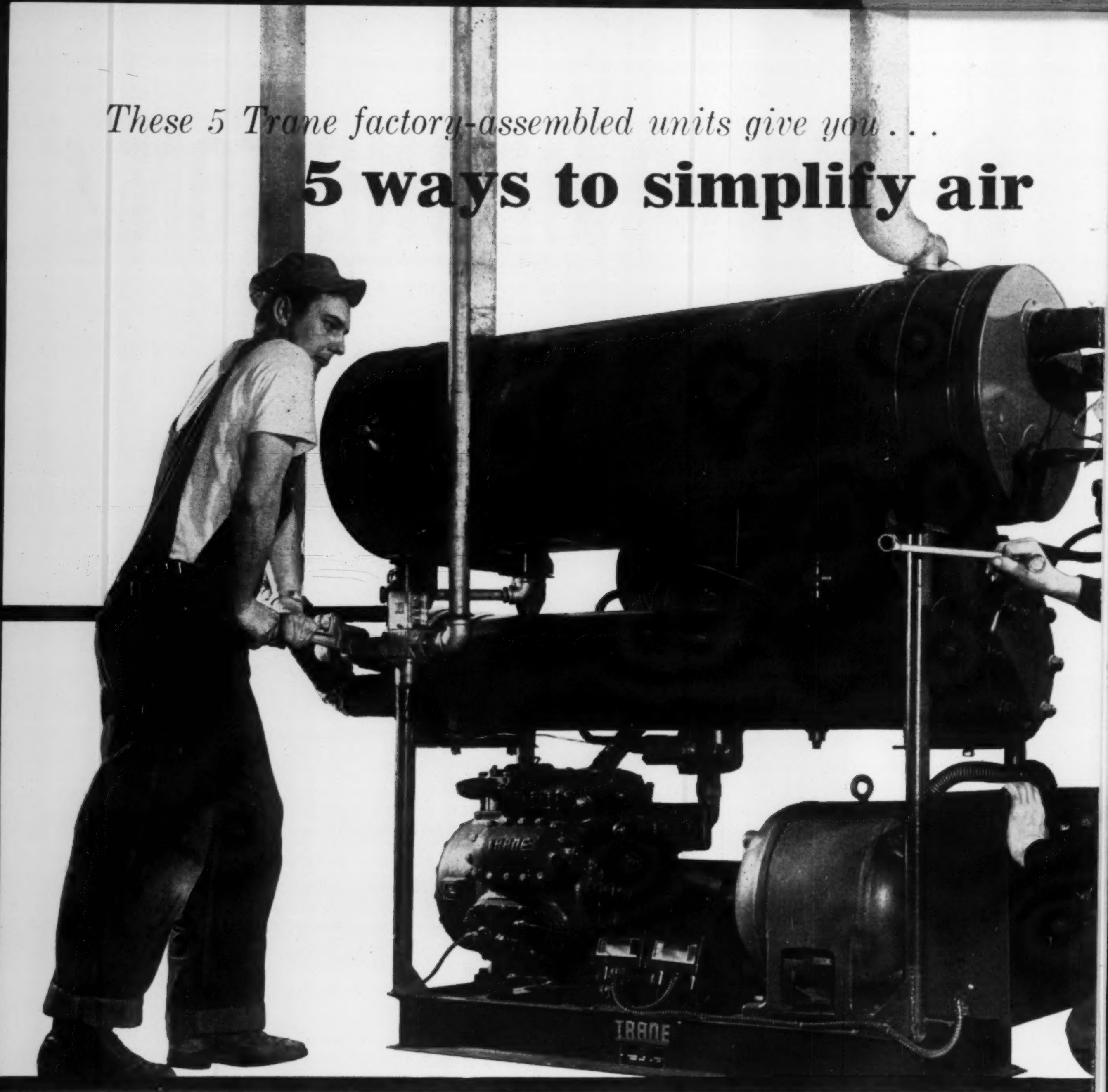
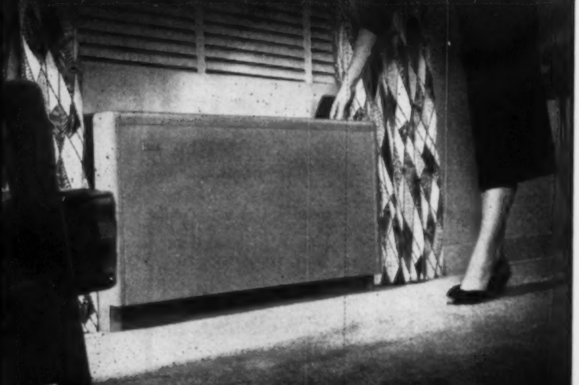
These 5 Trane factory-assembled units give you . . .

5 ways to simplify air



3. TURN TO SELF-CONTAINED UNITS for a fast design answer to smaller jobs—including those using duct work. TRANE *factory-assembled* units come ready-to-run, 3 to 20 tons. Larger sizes available with built-in evaporative condensers.

4. USE TRANE UNITRANE ROOM UNITS and you solve the design problem where individual room control is wanted, with maximum flexibility and economy of operation. Require only simple wiring and piping connections.

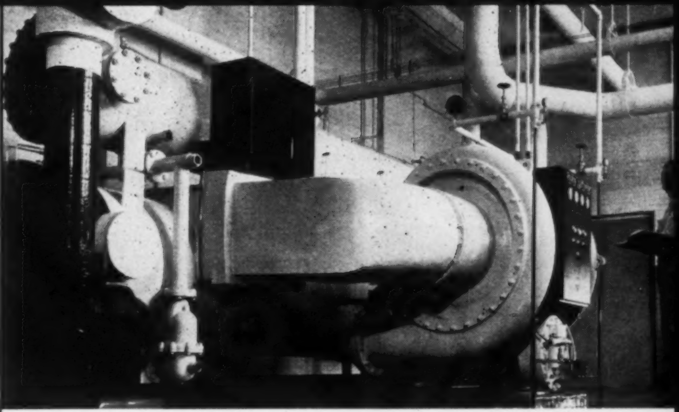


conditioning system design!

Save engineering time with complete, ready-to-install Trane water chillers . . . air handling units . . . room units . . . self-contained units.

You save engineering time—yes, and get *maximum satisfaction for your client!*—with TRANE *factory-assembled and factory-tested* air conditioning units, in which control circuits are wired and refrigerant piping is done *at the factory.* These factory-assembled components are *matched* components; they *guarantee* performance. And—as with all TRANE products—the published ratings are *accurate* ratings. You know what you're specifying, and you get what you specify, when you specify TRANE. Want more facts? See your nearest TRANE Sales Office for complete details or write TRANE, La Crosse, Wisconsin.

1. START WITH THE PRE-ENGINEERED WATER CHILLER on your small and medium-sized air conditioning jobs, either comfort or process. You save design time, you save design work . . . and, at the same time, *insure complete dependability.* Full, easy-to-use performance ratings on all 10 sizes from 10 to 100 tons. Completely assembled, tested, guaranteed—*at the factory.*



2. SPECIFY CENTRAVAC—THE HERMETIC CENTRIFUGAL for installation on *any floor*—roof-top to basement—in new and existing buildings. The CenTraVac is so quiet in operation it can even be placed adjacent to occupied areas.

5. SPECIFY THE VERSATILE CLIMATE CHANGER for central systems—its *flexibility* can make one basic design serve several applications. New model TRANE Climate Changers now sectionalized—more flexible than ever! 600 to 29,000 cfm.

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One source, one responsibility for:
Air Conditioning • Heating • Ventilating
Heat Transfer Equipment

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90 U.S. and 15 Canadian Offices.

Pipe for your next job in a jiffy!

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- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

●You get quick service when you order steel pipe from your Youngstown Distributor. His complete stock and speedy delivery assure your getting pipe **on time**. No need for you to carry excess pipe inventory—or put up with costly job delays because of lack of pipe; just 'phone your nearby Youngstown Distributor.

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THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices: Youngstown, Ohio - District Sales Offices in Principal Cities

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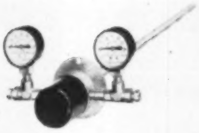
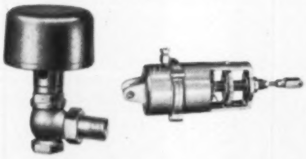
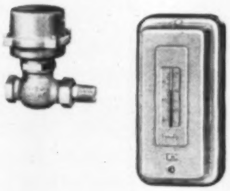


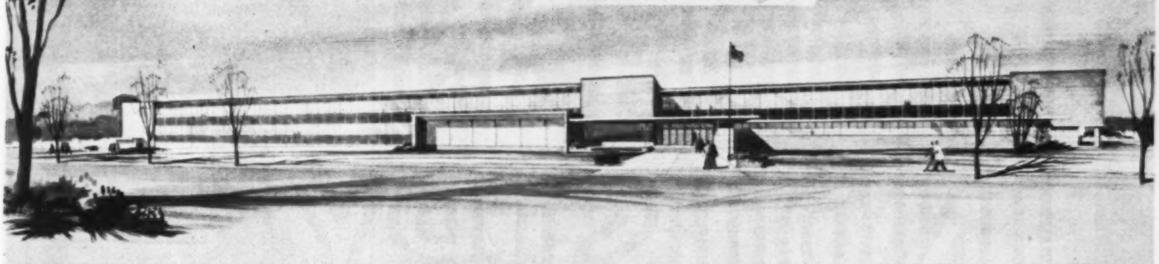


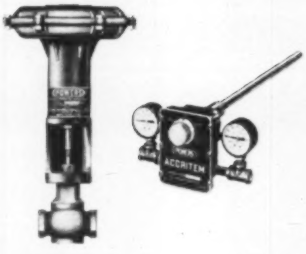
Powers Packless Control Valves
Eliminate packing maintenance and prevent leakage of steam or water.



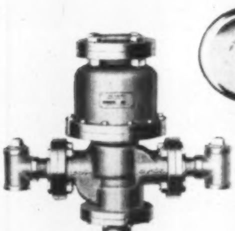
ARCHITECTS: Grassold-Johnson and Associates, Milwaukee, Wis.
ASSOCIATED WITH: The Board of School Directors, Fred E. Wegner, Architect
CONTRACTORS: Heating, S. V. Hanley Co. • Plumbing, Kuetemeyer Plbg. & Htg. Co.

Northwest Senior High School Milwaukee's new "school of the future"





Only a few Powers Controls for heating systems, shower baths and water heaters are shown here.



(b96)

POWERS *Automatic Temperature Control*

is being installed throughout this modern $4,500,000 building

For the classrooms and other heated and ventilated spaces Powers control will provide utmost comfort and fuel economy with lowest operating and maintenance cost. Some Wisconsin schools using Powers systems report dependable operation after 30 to 50 years.

Powers individually controlled shower baths and groups of lavatories and gang showers will be unsurpassed for safety, comfort and economical use of water.

Powers controls, on hot water service heaters and swimming pool heater, will prevent waste of fuel from overheated water and give years of dependable service.

You, too, Can Solve Most of Your Temperature Control Problems with Powers — one dependable source, one responsibility. Consult Powers on all temperature control problems. Our more than 60 years of experience will save time and help you get the right control for your requirements.

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SKOKIE, ILLINOIS • *Offices in 60 Cities in the U. S. A., Canada and Mexico*

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POWELL VALVES FOR MODERN INDUSTRY

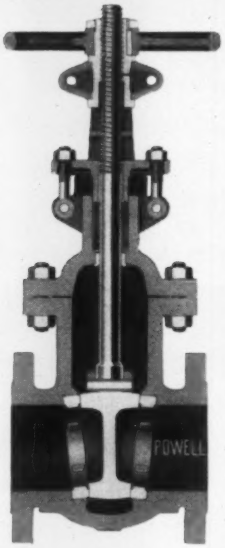


FIG. 1503 (sectional)
—150-Pound Steel
Gate Valve

FIG. 1793—Iron Body
Bronze Mounted Gate Valve
for 125 Pounds W.S.P

200 WOG
MS
POWELL
125

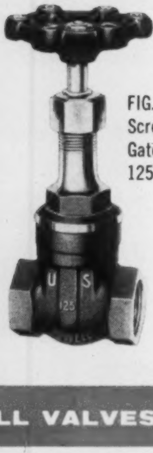


FIG. 500—Bronze
Screwed-in Bonnet
Gate Valve for
125 Pounds W.S.P.

FIG. 2608—Bronze
"W.S." Full Flow
Globe Valve for 200
Pounds W.S.P.

POWELL VALVES . . . THE COMPLETE QUALITY LINE . . . POWELL VALVES

When you think of valves—think of Powell. For Powell's is the *complete* quality line. Powell probably makes more kinds of valves and has solved more valve problems than any other organization in the world.

Shown above are just a few Powell Valves. Investigate these valves . . . *and* the *complete* line of quality valves that have a proven record of long and dependable service.

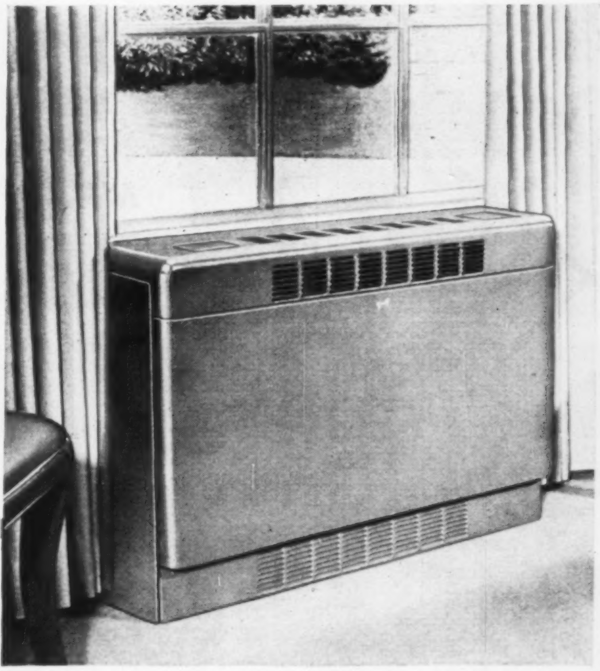
Consult your Powell Valve distributor. If none is near you, we'll be pleased to tell you about our complete line, and help you solve any flow control problem you may have. Write . . .

The Wm. Powell Company,
Cincinnati 22, Ohio . . . . . 109th year

Four Season

AIR CONDITIONING

in one compact unit...



new

"ROOMAIRE" CONDITIONER by Young

for HOSPITALS, HOTELS, MOTELS, SCHOOLS, APARTMENTS, HOMES

"Roomaire" Conditioners can be installed either free-standing or partially recessed.

"Roomaire" Conditioners provide four season air conditioning in one compact, individually controlled unit. They cool, dehumidify, heat, ventilate, filter and circulate, operating with hot water in winter and chilled water in summer . . . using *the same piping*.

"Roomaire" units are ideal for installation in hotels, hospitals, motels, schools, apartments, homes and public buildings where individual room conditioning is desirable. Only 9¼" in depth, the "Roomaire" Conditioner requires a minimum amount of floor space, and it can be partially recessed if desired.

The functional design of the "Roomaire" unit provides efficient air distribution through grilles at the top and front of the cabinet. Recirculated air is drawn through a return air grille at the bottom of the unit and fresh air can be admitted through a dampered opening in the back of the unit (optional). All air passing into the unit is filtered through permanent, cleanable type filters. Component parts are completely accessible with removal of the front panel.

"Roomaire" Conditioners are available in three sizes, 200, 400 and 600 cfm with nominal cooling capacities of ½, 1 and 1½ tons to meet every room conditioning requirement. For complete details on "Roomaire" Conditioners see your nearest Young Representative listed in the yellow pages of your telephone directory or fill in the coupon and mail it to the Young Radiator Company, Racine, Wisconsin.

FOR MORE DETAILS MAIL COUPON TODAY

Young **RADIATOR COMPANY**

RACINE, WISCONSIN

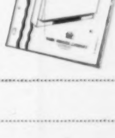
Creative HEAT TRANSFER ENGINEERS FOR INDUSTRY

Heat Transfer Products for Automotive, Aviation and Industrial Applications.

Heating, Cooling, Air Conditioning Products for Home and Industry.

***Executive Office:* Racine, Wisconsin, *Plants at* Racine, Wisconsin, Mattoon, Illinois**

YOUNG RADIATOR COMPANY
Dept. 515-C, Racine, Wisconsin
Please send me your free Catalog No. 7754 completely describing "Roomaire" Conditioners by Young.



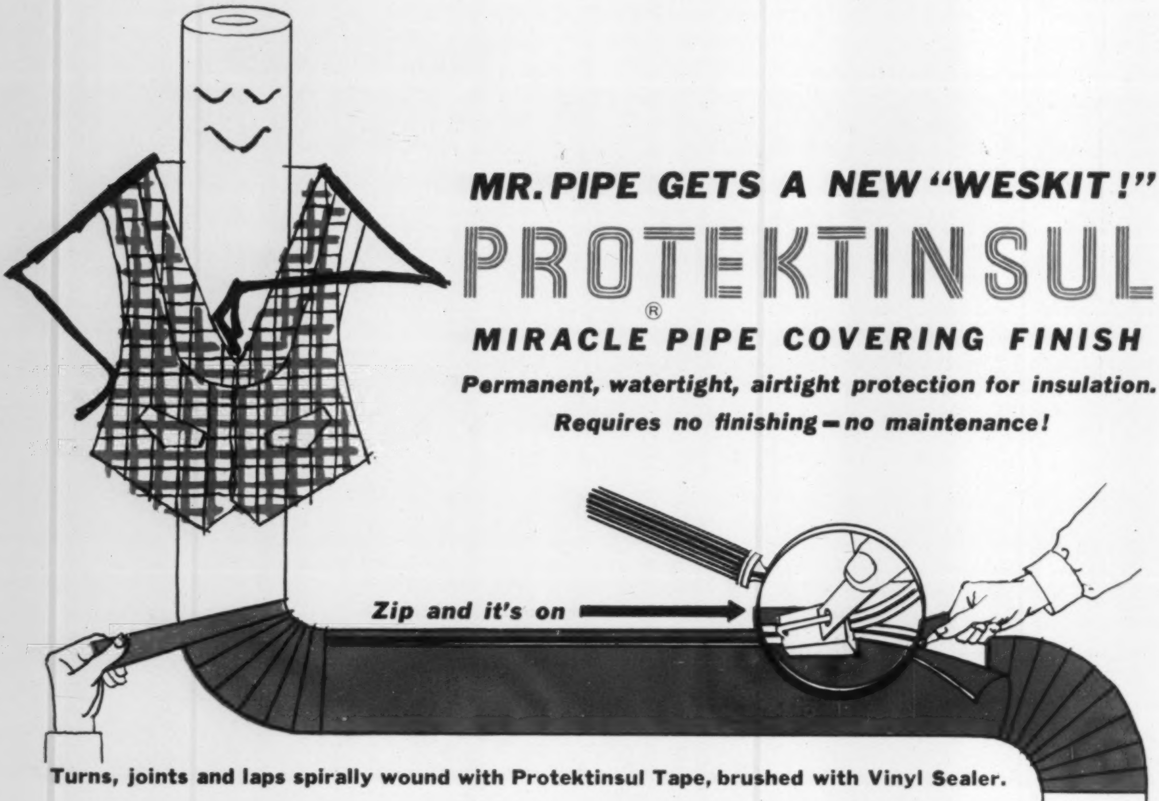
Name..

Position..

Company...

Address...

City..State....................



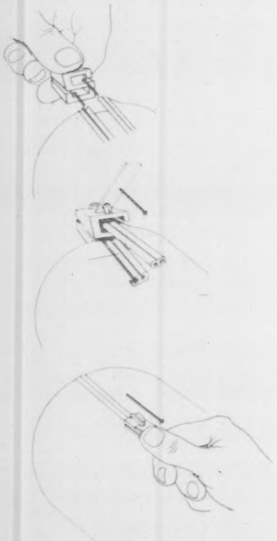
MR. PIPE GETS A NEW "WESKIT!"

PROTEKTINSUL®

MIRACLE PIPE COVERING FINISH

Permanent, watertight, airtight protection for insulation.
Requires no finishing—no maintenance!

Turns, joints and laps spirally wound with Protektinsul Tape, brushed with Vinyl Sealer.



Method of applying Zipper to covering.

PROTEKTINSUL, new thermal insulation pipe and duct covering finish, is a .012″ thick, prefabricated, poly-vinyl chloride outer finish that effectively protects insulation against weather, abrasion, chemicals, and mildew. Prefabricated to exact size, PROTEKTINSUL zips on and locks in place, requiring no cutting, fitting, sewing or painting in the field.

Never before a pipe and duct covering finish to give this combination of protection and beauty so important to institutions, hospitals, schools, where cleanliness is such an essential factor. Available in standard colors, or color combinations, for identification.

FREE: PROTEKTINSUL brochure gives vital information for architects on this unique development for insulated pipe and duct coverings, complete with details, properties, and specifications. Write for your free copy today.

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MIRACLE ADHESIVES CORPORATION • 214 E. 53rd ST., NEW YORK 22, N. Y.

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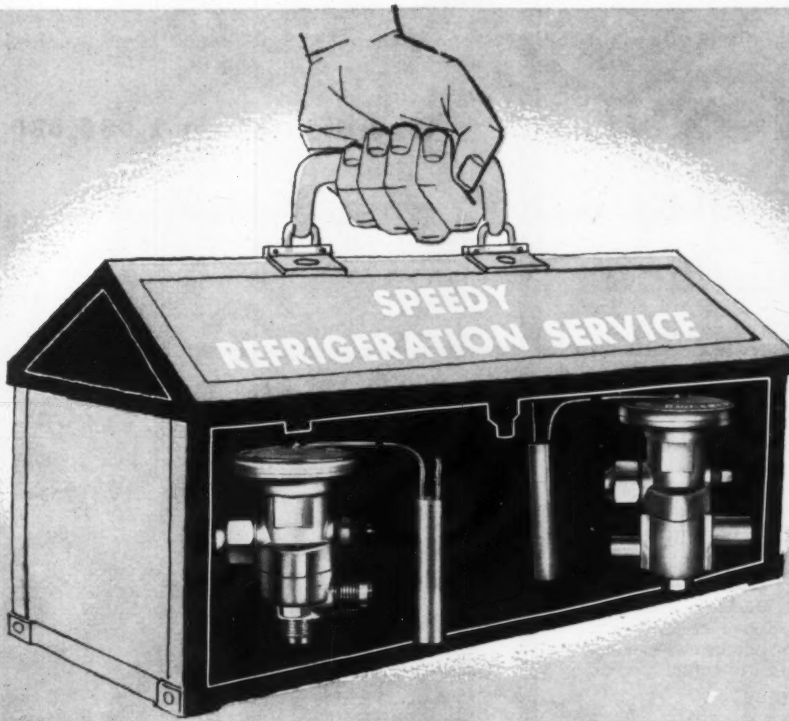

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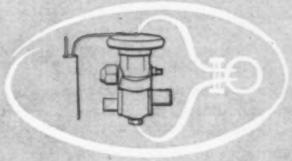
WITH ALCO T SERIES THERMO VALVES

. . . for all temperature ranges, all operating conditions

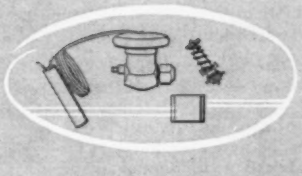
EASY INSTALLATION

Headroom of 2½ inches is sufficient space for installation and servicing.



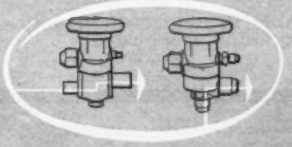
EASY SERVICING

Come-apart construction . . . instant access to all working parts for cleaning, repair, capacity change. No need to break the connections.



EASY TO SPECIFY

Straight through or angle connections—choose the type that fits the job. Parts are interchangeable.



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Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

6314

SEE YOUR ALCO WHOLESALER

REZNOR'S
new SECTIONAL
Duct Furnace

- **Capacities to over 2,000,000 BTU**
- **Sectionalized to simplify installation**

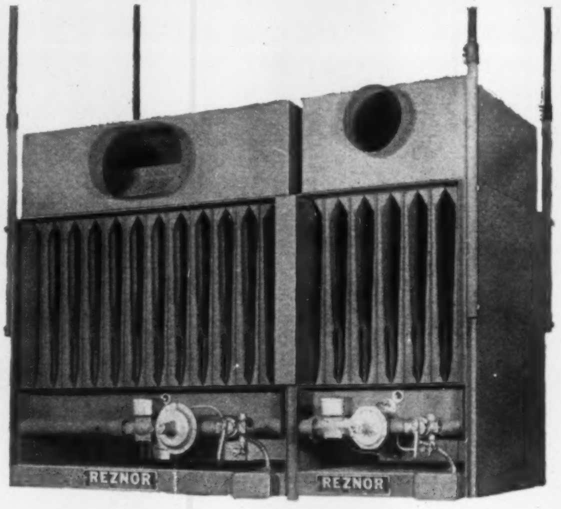
Now you can design the *ideal* system for every duct heating situation — and be sure of the equipment to make it work. Reznor's sectionalized assembly (a completely new concept in duct heating equipment) means that installation problems no longer keep you from planning capacities up into the millions.

To provide a system of maximum efficiency at lowest cost, install one of these new furnaces as the heat exchanger with components for air moving, cooling, cleaning and humidification chosen to meet the requirements of the specific application.

New Reznor series DS sectional duct furnaces are assembled on the job out of four basic sections: 150,000 - 200,000 - 250,000 - 300,000 BTU. Capacities range upward in steps of 50,000 BTU from 150,000 to several million BTU. And because the new units are designed to handle large volumes of air with minimum pressure loss, capacities in excess of 2,000,000 BTU are often completely practical.

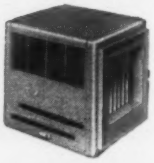
In addition to the revolutionary DS series, Reznor engineers have also perfected a completely new design for a series of small capacity duct furnaces. Though differing in construction from the DS series, the new series D models offer the same advantages of high efficiency, compact design and light weight. And they have the same adaptability to use in all custom engineered systems for comfort or process heating.

Suggestions on how to take advantage of Reznor's new concept — sectionalized assembly — plus complete details on construction and performance of the new units are included in two new bulletins. Because a Reznor duct furnace may be the key to the solution of any particularly difficult problem, you need to have these bulletins in your files. Use the coupon below to send for your free copies today.



SERIES DS — 150,000 to several million BTU

Each section is complete with controls and built-in draft diverter. Sections can be operated independently to meet less than peak load requirements. Burners are installed in a drawer which slides out the front of the unit to provide easy access for inspection and cleaning. All controls are attached to the burner drawer. Sections may be installed side-by-side in a single bank or back-to-back in a double bank. View above shows the 450,000 BTU model (one 150,000 BTU and one 300,000 BTU section assembled side-by-side).



SERIES D —
50,000 to 125,000 BTU

Reznor series "D" duct furnaces are designed primarily for residential and small commercial applications. Four sizes — 50, 75, 100 and 125,000 BTU. Handsome steel cabinets have burner access and controls completely enclosed on one side.

REZNOR MANUFACTURING COMPANY
51 Union Street, Mercer, Pa.

Please send me my free copies of Bulletins B-55-D and B-55-DS on your new duct furnaces.

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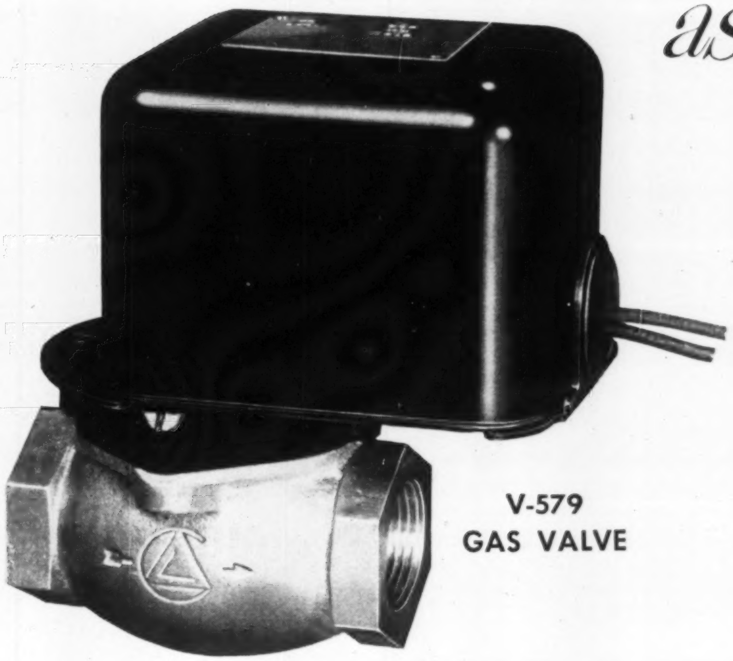
REZNOR
THE WORLD'S LARGEST-SELLING GAS UNIT HEATERS

quiet
as a flame!



V-579
GAS VALVE

You'll have– **MORE SATISFIED CUSTOMERS . . .**
MORE PROFITS

with V-579 Gas Valves by DETROIT CONTROLS. No click, no hum, no noise because the V-579 is operated by positive opening, positive closing "Biflex" motor!

Install these V-579 gas valves close to living rooms or sleeping rooms, secure in the knowledge that they will operate dependably and *quietly*. Their operation is independent of gas pressure and gravity. Ideal for *all* types of gas, in any domestic heating unit! ½ inch to 1¼ inch sizes.

Talk to your Detroit Controls Wholesaler *Today* . . . or write for Bulletin 229.

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AUTOMATIC CONTROLS *for* REFRIGERATION
AIR CONDITIONING • DOMESTIC HEATING • AVIATION • TRANSPORTATION • HOME APPLIANCES • INDUSTRIAL USES
Serving home and industry
AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

In all large buildings many requirements determine the air conditioning system. Number of occupants and glass areas and heat loads and floor areas . . . economic considerations, taxes, depreciation and a host of other factors vary from building to building. Obviously, no one system—or even two or three—can air condition each building best. That's why York selects and then precision-engineers each system to fit the particular building in which it is installed.

The ability to meet rigid specifications, to bring the *right kind* of air conditioning to a building—and to do it all at a reasonable price—appeals strongly to our first-time customers. They call it a "new concept" of air conditioning. This concept is possible, not only because York Engineers are highly trained and experienced professionals in the science of air conditioning, but also because they have an extremely wide range and variety of quality equipment from which to choose.

This new skyscraper demonstrates a "new concept" of air conditioning with a Yorkaire System!

Superb new 34th Street Building, NYC, where a precision-engineered Yorkaire System will bring the *right kind* of air conditioning to thousands of occupants. Your building, too, can have York's right kind of air conditioning. Call your York District Office (listed in the classified telephone directory of every major city). Or write York Corporation, York, Pennsylvania.

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Three York Water Cooling Systems, totalling 2150 hp., supply cooling for 1250 Model CI Yorkaire Conditioners. Owner—Webb & Knapp, Inc.; Consulting Engineer—W. R. Cosentini & Associates; General Contractor—Webb & Knapp Construction Co., Inc.; Mechanical Contractor—Kerby Saunders, Inc.; Architects—R. C. Brugnoni and R. Boehler.

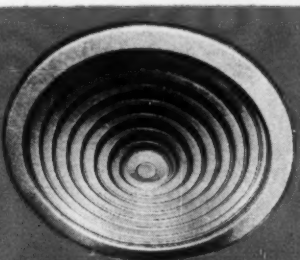
York
refrigeration
air conditioning

YORK CORPORATION

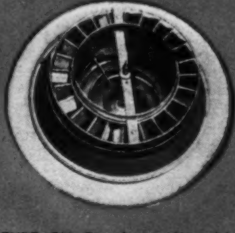
the quality name in air conditioning

HEADQUARTERS FOR MECHANICAL COOLING SINCE 1885

TYPE R Circular, adjustable volume, constant pattern and radius of diffusion.



TYPE V Circular, adjustable volume and pattern, for heating and cooling.



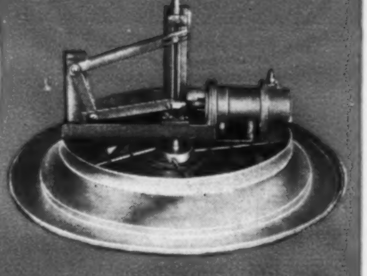
TYPE CH Circular, adjustable supply and return, for heating and cooling.

a model for every diffuser need FLEXIFLO

TYPE S Half-round, for side wall or ceiling, for heating or cooling.

- CIRCULAR
- SQUARE
- RECTANGULAR
- ADJUSTABLE
- AUTOMATIC

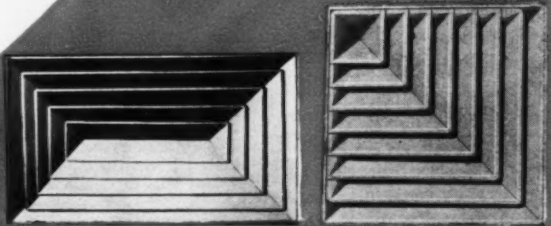
All FLEXIFLO diffusers are styled simply, beautifully . . . finished in baked enamel of any desired color . . . extra features include built-in equalizing deflectors . . . simple, easy installation and removal of diffuser cores with just a "twist of the wrist."



TYPE A Circular, adjustable volume, constant pattern *AUTOMATICALLY CONTROLLED.*

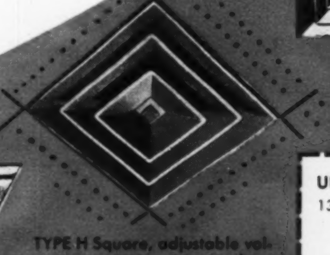
A COMPLETE LINE OF DIFFUSER ACCESSORIES

Let a trained FLEXIFLO sales engineer help you solve your air distribution problem. Representatives in major cities throughout the U.S. and Canada.



TYPE MP Rectangular, for one, two, three or four-way diffusion, 16 styles, hundreds of sizes to accommodate any shaped area.

TYPE MPL Long strips of any length, for one- or two-way diffusion.



TYPE H Square, adjustable volume, constant pattern and radius of diffusion.

UNIVERSAL DIFFUSER CORP.
1360 GARRISON AVE., NEW YORK 59, N.Y.

UNIVERSAL DIFFUSER CORPORATION
1360 Garrison Avenue, New York 59

Please send me a complete catalog on

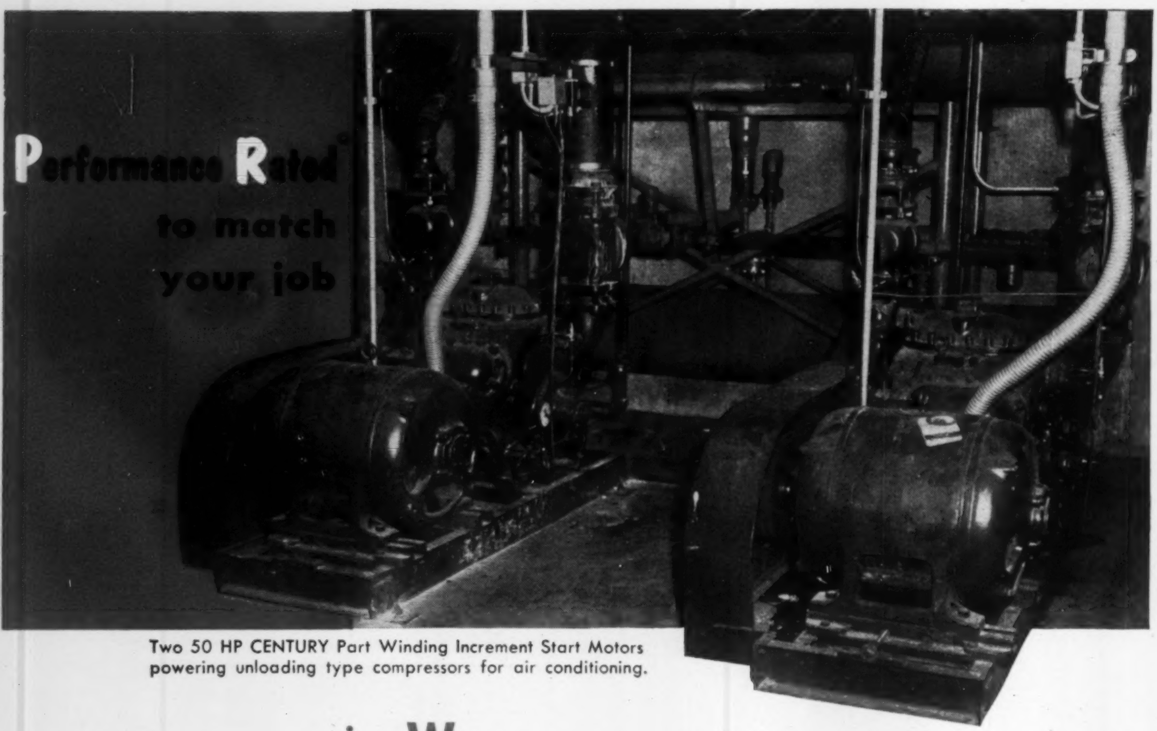
☐ Circular Diffusers ☐ Square & Rectangular Diffusers

NAME____________________

COMPANY____________________

STREET____________________

CITY____________________STATE__________



Two 50 HP CENTURY Part Winding Increment Start Motors
powering unloading type compressors for air conditioning.

**Here's how
part winding increment
starting works for you:**

Motors of the increment starting type operate by electrically separating the motor winding into two parts. One half the winding operates when starting, delivering roughly half the normal starting torque, drawing about one half the normal starting current. After a few seconds the increment starting control connects the second half of the winding into the circuit delivering full torque and current.
The three step starter uses a series resistance to further reduce the current on the first step of the starter.

Where you need low starting current . . . you can save with

Century Part Winding Increment Start MOTORS

Starting large motors where there is a limitation on the amount of starting current may be done easily and inexpensively with CENTURY Part Winding Increment Start Motors and control.

Available from stock in all popular sizes, enclosures, and mountings.
1 to 400 HP polyphase.

- **Drip proof**
- **Splash proof**
- **Dust proof**
- **Explosion proof**

HORIZONTAL OR VERTICAL MOUNTING

Because all popular CENTURY Motors have provisions for part winding increment starting, they are available from stock in the complete Performance Rated Century line.

Performance Rated©
1/8 to 400 H.P.

Century C MOTORS

Write for Bulletin 14-157 P.1, or call your nearby Century Distributor or Century District Sales Office.

CENTURY ELECTRIC COMPANY

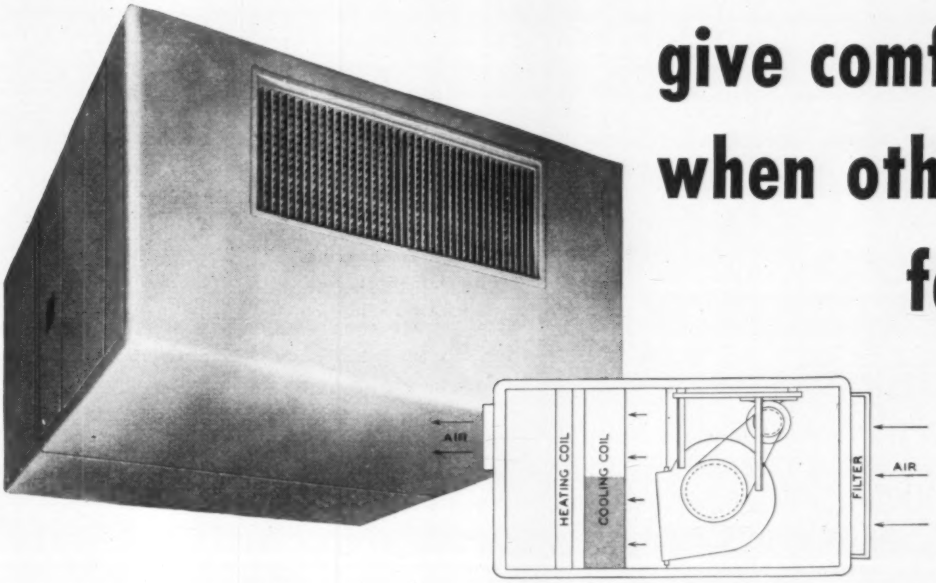
830

1806 Pine Street • St. Louis 3, Missouri
Offices and Stock Points in Principal Cities

KRAMER

AIR CONDITIONING UNITS with MUGGY-AIR CONTROL

give comfort when others fail!



Another new Kramer achievement. Muggy-Air-Control takes the "chill and dampness" out of cooling on "muggy days" without reheat or dampers.

With two independent refrigerant circuits the upper circuit can be cut out on high humidity days. This sharply increases the dehumidifying effect by lowering the coil refrigerant temperature. Air is by-passed through the non-operating circuit and will mix with the dehumidified air to give desirable discharge temperatures and thus overcome short-cycling and uncomfortable conditions on muggy days.

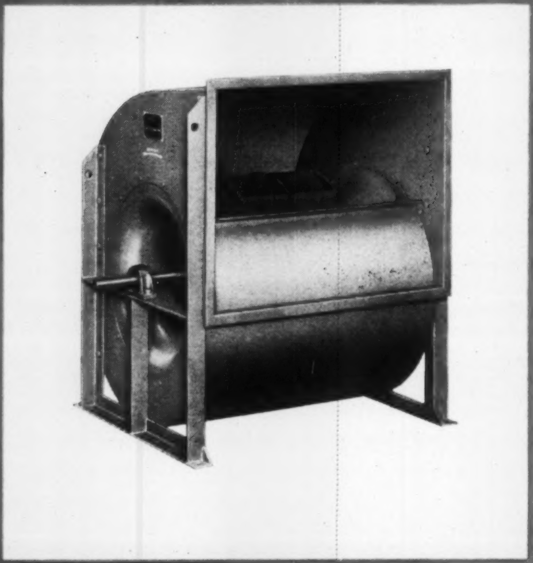
Other distinct features of the Kramer Air Conditioning Unit are: the "Blow-Through" design, the Anti-Sweat construction, the "floating power" mounting, the nearly silent operation, and the eye appealing design.

WRITE FOR BULLETIN NO. AC-238

KRAMER TRENTON CO. • Trenton 5, N.J.

tall,
light and
cool!

Efficiency begins, according to experts, with comfortable surroundings. Los Angeles' Tishman Building offers its fortunate occupants the utmost in cool comfort, thanks to the use of Utility Blowers in the air conditioning system.



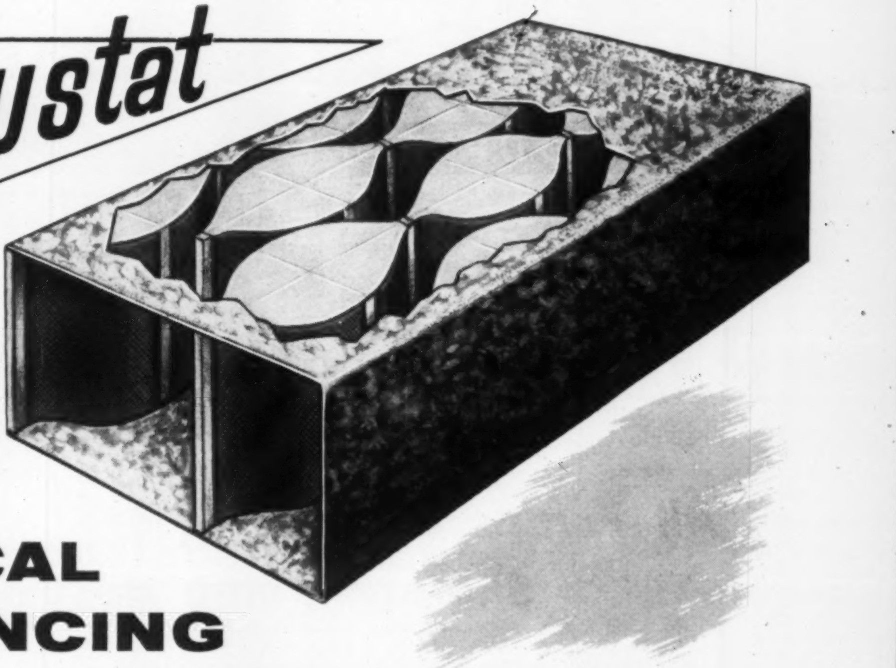
Manufacturers of heavy and standard duty blowers for heating, air conditioning and ventilating installations. Producers of blowers and blower parts for original equipment manufacturers. Write for catalogue data.

UTILITY
FAN CORP.

911 EAST 59th STREET
LOS ANGELES 1, CALIF.

A DIVISION OF
UTILITY APPLIANCE CORP.

Aircoustat



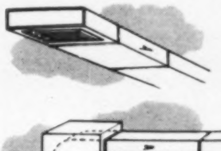
PRACTICAL SILENCING

for AIR CONDITIONING SYSTEMS

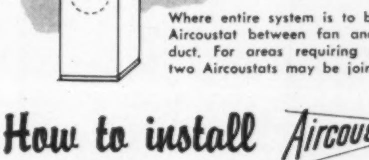
Aircoustat is a compact, *completely packaged* unit for silencing fan and air noise in air conditioning systems. Easily installed directly into the duct work, Aircoustat eliminates the need for costly, extensive duct lining. And results are astonishing: one 7 *foot* unit reduces noise level below what *100 feet* of commercial duct lining could accomplish.

Engineered to provide broad band attenuation with low pressure drop, Aircoustat is available in 14 standard sizes for use with all styles and sizes of duct, and 8 types to meet any desired conditions. Selection is no problem: ***if it fits geometrically, it fits acoustically.***

Where to install Aircoustat

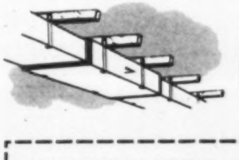


Aircoustats are incorporated as part of the duct work. If only selected areas require quiet, install above individual diffusers.

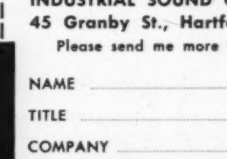


Where entire system is to be silenced, insert Aircoustat between fan and first length of duct. For areas requiring special silencing, two Aircoustats may be joined in series.

How to install Aircoustat



Aircoustat requires no special tools for installing. It is constructed to be joined to ductwork with a lock seam.



If ductwork and Aircoustat differ in size, a canvas or asbestos coupling may be used. If ductwork is hung, support Aircoustat similarly.

Mail this coupon TODAY ▶▶▶

SILENCE SERVICE

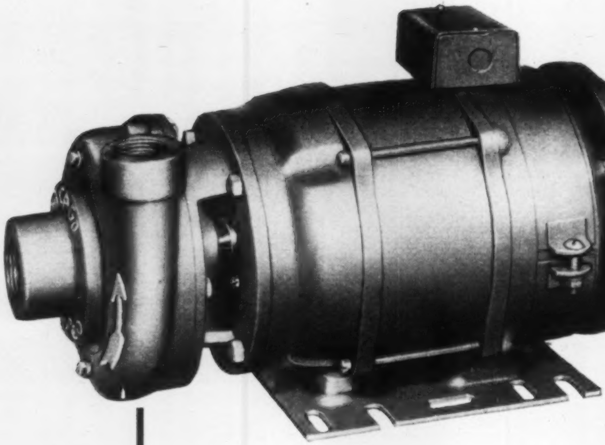
Industrial Sound Control Inc.
45 Granby Street, Hartford 12, Conn.

INDUSTRIAL SOUND CONTROL, INC.
45 Granby St., Hartford 12, Conn.
Please send me more information on AIRCOUSTAT.

NAME ....
TITLE ....
COMPANY ....
ADDRESS ....
CITY .... ZONE .... STATE ....

CLOSE-COUPLED

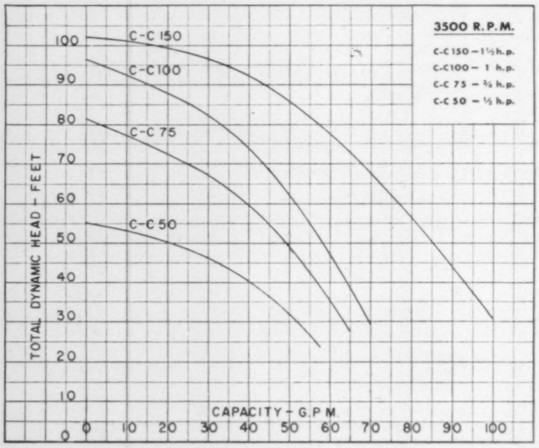
PUMPS



All Pumps in stock
Shipped same day order received

TYPICAL C-C SERIES PUMP APPLICATIONS ARE:

Cooling Towers • Air Conditioning
Chilled Water Circulating
Hot Water Circulating
Pneumatic Water Systems
Booster Systems



CHICAGO
PUMP CO

C-C Series pumps are equipped with a Leak-Proof "Chicago Mechanical Seal". Each pump operates over the entire range of its curve quietly and smoothly without motor overload. Write to Department A for Bulletin 108-G.

CHICAGO PUMP COMPANY

Subsidiary of Food Machinery and Chemical Corporation
BUILDING and INDUSTRIAL DIVISION
622 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Condo-Vac, Sure Return. AVC, LVC, Fire, House & Circulating Pumps Pneumatic & Tankless Water Systems.

Flush-Kleen Sewage Ejectors Little Giant & Non-Clog Bilge Pumps Pumps for every industrial use.

MORE for your money.....

WHEN YOU SPECIFY...

WATTS A.S.M.E. RATED
WATER PRESSURE
RELIEF VALVES

No. N74
¾ x 1″ connections

Dollar for Dollar
Watts New N74

WATTS MADE THE FIRST . . .

non-metallic disc-to-metal seated A.S.M.E. steam rated Hot water Pressure Safety Relief Valve

provides the lowest cost per thousand B.T.U. capacity. (At 30 lbs. setting — over 675,000 B.T.U.'s.) When you buy A.S.M.E. rated protection, you pay for a B.T.U. emergency steam relieving capacity — so why not get the most for your money. The newly redesigned N74 water pressure relief valve features bronze body and internal trim, stickage-free silicone disc, stainless steel spring, and nylon-reinforced Buna-N diaphragm seal which isolates all working parts during relief of water or steam.

Watts A.S.M.E. rated water Pressure Relief Valves are offered in a complete range of sizes from ¾″ to 2″ inclusive and are applicable to residential, commercial, institutional, or industrial installations.

Compare Watts N74 with any other valve

WATTS REGULATOR COMPANY

Since WATTS 1875

LAWRENCE, MASSACHUSETTS

LARGEST AND MOST COMPLETE LINE OF ITS KIND IN THE WORLD.

An engineer from Quinn & Feiner, Refrigeration and Air Conditioning contractors, shown checking the largest reciprocating compressor installation in the East.

McCrory's

IS A PLEASANT PLACE TO SHOP

p·k COOLERS ARE INSTALLED HERE

McCrory's spacious and sparkling new store at Livingston Street in Brooklyn is the world's largest variety store. Careful planning has made it an inviting place to shop.

p·k dry expansion freon coolers, an integral part of the air conditioning system, supply chilled water to eight remote conditioners. Four of these coolers – three in the subbasement and one on the second floor – provide a total capacity of 350 tons of refrigeration in which they cool 1000 GPM of water to 44 deg. F.

Economical and efficient, **p·k** coolers have earned a place for themselves in commercial and industrial building. A pioneer in the development of many types of heat exchange equipment, **p·k** has provided exchangers for virtually every type of application.

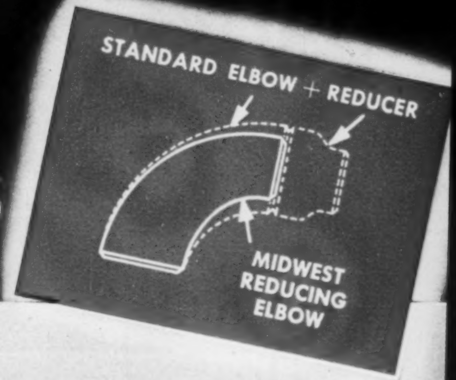
What are your heat exchange needs? Heating? Cooling? Custom built or standard units? **p·k** has a wealth of experience in helping people like yourself select the proper equipment for their particular applications. **p·k** catalog #101-A gives standard range of freon coolers.

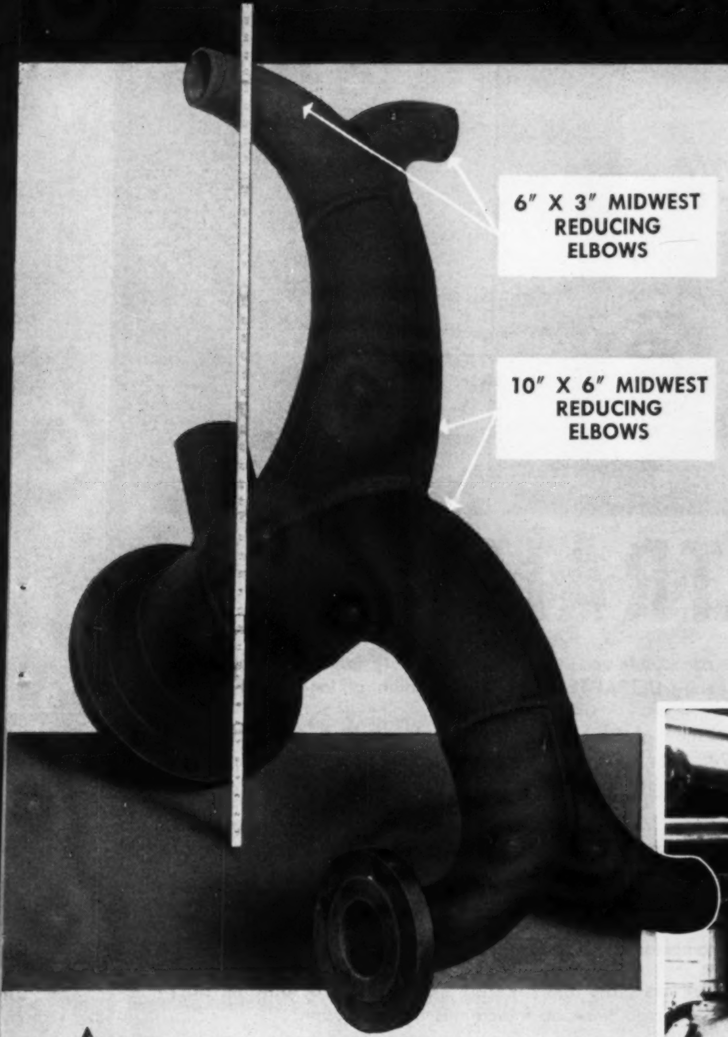
the **Patterson-Kelley Co.,** inc.
730 Burson Street, East Stroudsburg, Penna.

2526

101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities.

Better Piping at a Better Price by Using MIDWEST REDUCING ELBOWS

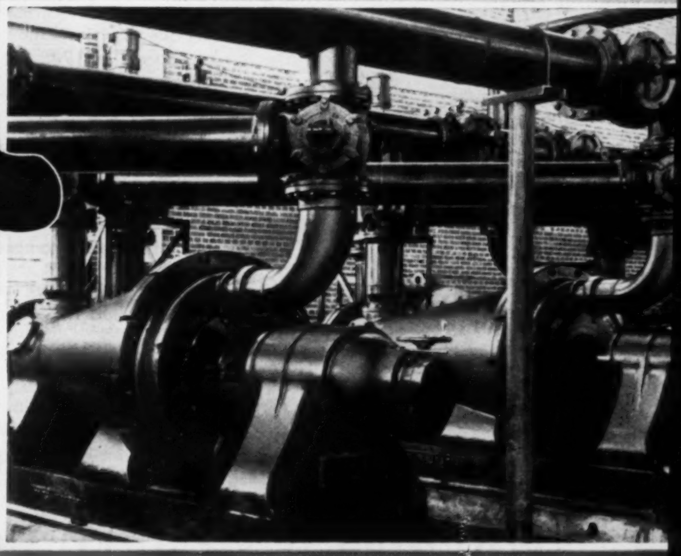



6" X 3" MIDWEST REDUCING ELBOWS
10" X 6" MIDWEST REDUCING ELBOWS

The Midwest Reducing Elbow offers important advantages in both piping design and piping cost. It needs only two welds instead of the three required by a standard elbow and a reducer (see sketch above). There is also a saving in layout time. Turbulence and pressure drop are reduced by the gradual taper . . . less space is needed . . . insulation is easier . . . and piping appearance is improved.

Only Midwest Reducing Elbows are available from stock in sizes to 16" . . . larger on special order. They have the same dimensional accuracy, uniformity of wall thickness, exact included angle and true center-to-end dimensions of Midwest Straight Elbows. For further information, ask for Catalog 54.

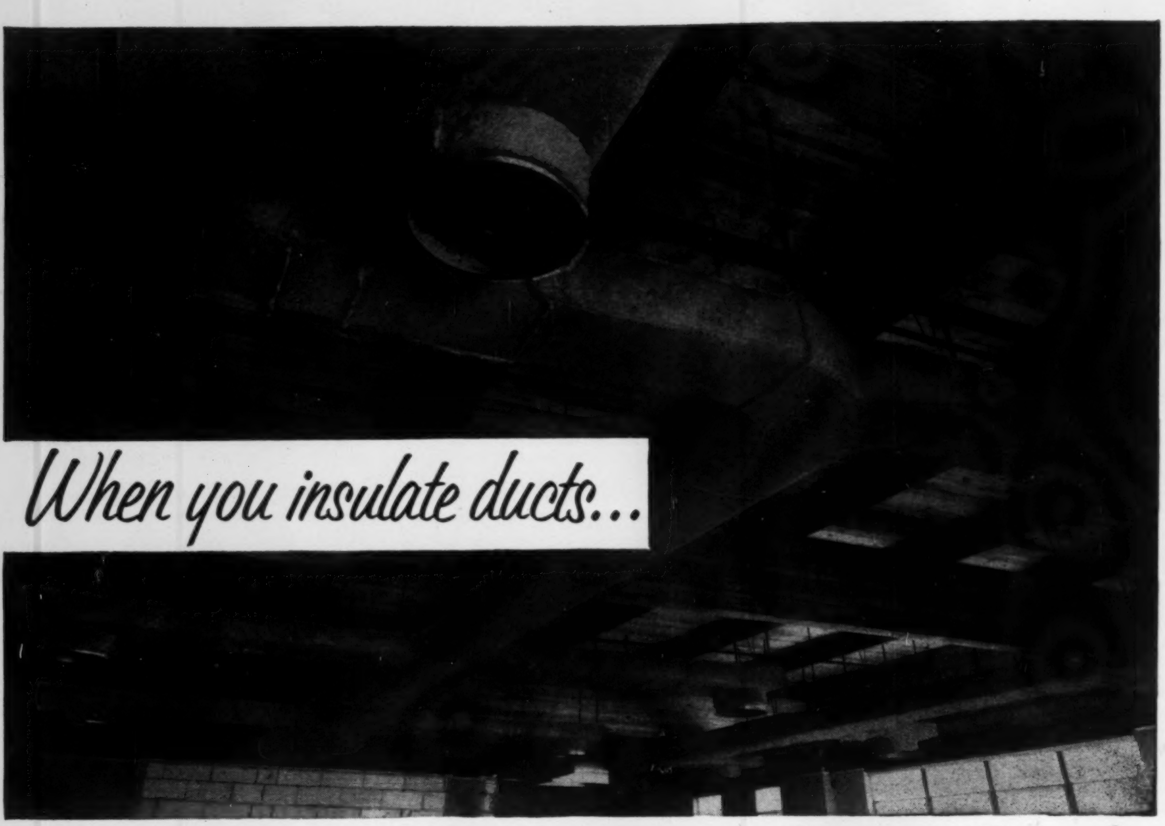
↑ Midwest Reducing Elbows made it possible to fabricate this transformation piece for a boiler feed suction line so that it could be installed in the limited space available and still get the benefit of streamline flow. There was also a cost saving in comparison with a less efficient and bulky assembly made with straight tees, ells and reducers.



⟶ Paper stock flows with minimum resistance through Midwest Reducing Elbows from 8" connection on Jordan to 10" header. Other advantages over standard elbow and reducer: a saving in cost and space, and improved appearance.

MIDWEST WELDING FITTINGS
Improve Piping Designs
and Reduce Costs

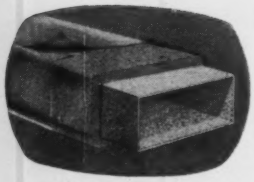
MIDWEST PIPING COMPANY, INC.
Main Office: 1450 South Second Street, St. Louis 4, Mo.
Plants: St. Louis, Passaic, Los Angeles and Boston
Sales Offices: New York 7—30 Church St. • Chicago 3—79 West Monroe St. • Cleveland 14—616 St. Clair Ave. • Los Angeles 33—520 Anderson St. • Houston 2—1213 Capitol Ave. Tulsa 3—224 Wright Bldg. • Boston 27—426 First St.
STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

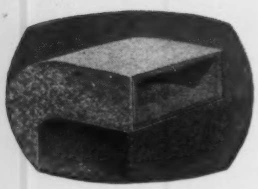


When you insulate ducts...

think of ULTRALITE...*first!*

When you want *performance* you can count on — and prompt *delivery* you can count on — specify ULTRALITE, the only insulation of long glass fibers!





first flexible duct insulation of fine glass fibers on the market! Only Ultralite, introduced in 1945, has a *10-year* record of completely satisfactory performance — without losing thickness or thermal efficiency.

first flexible duct insulation of fine glass fibers available with factory-applied vapor barrier. Ultralite is still available plain or with a wide choice of facings — some for appearance, some as vapor barriers.

first flexible glass fiber insulation to spring back to full original thickness every time after being compressed!

first flexible duct liner of fine glass fibers. Recent examinations of Ultralite Duct Liner installed 7 years ago show no indications of air erosion.

first flexible duct liner on the market with spray coating (1948).

first flexible glass fiber insulation available nationwide at convenient stocking points for immediate delivery. And ULTRALITE is still available *more* readily, in *more* cities, than any other glass fiber insulation!

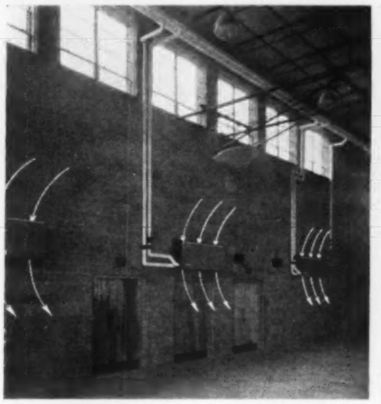
Ultralite distributors are listed in the Yellow Pages in 57 Cities.

GUSTIN-BACON *Manufacturing Company* **gb**

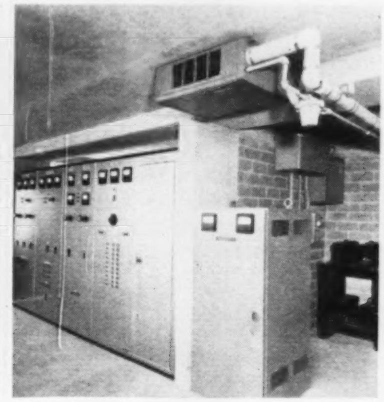
Molded glass fiber pipe insulation • Pipe couplings and fittings • Thermal and acoustical insulations

220 W. 10th St., Kansas City, Mo.

VERSATILE MODINE CABINET UNIT provides year 'round office comfort. Quickly and quietly distributes filtered heated or cooled air . . . introduces fresh air for ventilation.



HEAT LARGE AREAS with Type BT units mounted high on outside wall in inverted position. Heated air is directed downward for maximum comfort.



CEILING INSTALLATION of Modine Type BT Cabinet Units delivers large volumes of heated air . . . quietly and gently. Temperature is controlled automatically.

SIMPLIFY MODERNIZATION JOBS. One Modine Cabinet Unit replaces up to three or more unsightly cast iron radiators . . . recesses neatly in the wall.

PICK YOUR HEATING PICTURE

Then see how much better Modine Cabinet Units do the job....

MODINE has the answers to your heating problems. Whether it's new construction or remodeling, Modine Cabinet Units do the job better . . . in less space . . . at lower cost. The heating applications pictured above are only four of many hundreds of efficient, attractive installations.

Modine Cabinet Units are the ultimate in versatility. Some models heat with hot water, cool with chilled water. Others for steam or hot water heating only. There are five enclosure types . . . capacities from 120 to 640 Edr. All have quiet blower fans for positive yet gentle circulation of air. Take *your* difficult heating problems to the Modine representative listed in your classified phone book. Or mail coupon at right.

Modine CABINET UNITS

MODINE MFG. CO.
1509 DeKoven Ave.,
Racine, Wis.

Please send me immediately a free copy of Bulletin describing Modine Cabinet Units.

Name ....

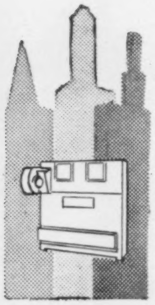
Firm ....

Address ....

City .... Zn ...... State ....

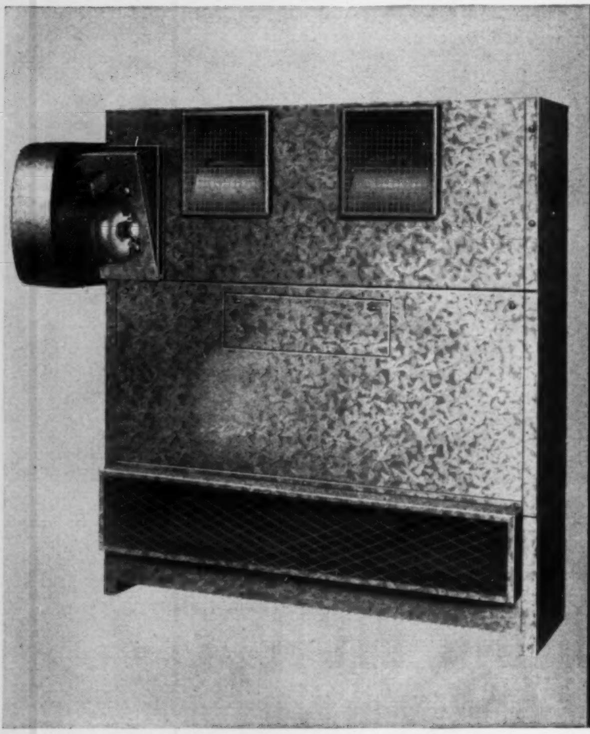
C-1246

towering quality



Acme WATER SAVING COOLING TOWER

with All-Metal hot-dip galvanized construction for longest life—fastest heat transfer



FEATURE FOR FEATURE Acme GIVES MORE

1 Modern, compact all-metal construction — no wood to rot, no painting required.

2 Steel is completely hot-dip galvanized after fabrication for maximum rust and corrosion protection.

3 Quiet, blower-induced constant volume air flow.

4 Wetted metal deck principle—fastest heat transfer.

5 Pumps built specially for cooling tower service.

6 All functional parts easily accessible for cleaning.

7 Flush-type air inlets and outlets.

8 Full capacities delivered as rated.

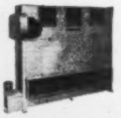
9 Can be installed in any location indoors or out.

Your clients will receive maximum cooling tower value for their dollars when you recommend and specify ACME. Built by a firm with 35 years' experience in serving the refrigeration and air conditioning industries, ACME cooling towers combine advance design with quality construction. This means top performance and long life service with minimum maintenance cost. Write today for your copy of the ACME Cooling Tower catalog.

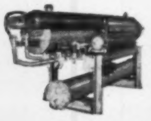
Acme Cooling Tower is serving firms like these . . .

Cincinnati Milling Machine Co.
Bell Telephone
Batelle Memorial Institute
Western Can Company
Chase Brass & Copper
Ford Motor Corp.
Revere Corporation

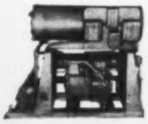
Dry-Ex® (Direct expansion) Liquid Chiller



Acme Cooling Towers and Evaporative Condensers



Flow-Therm® Packaged Liquid Chiller



Flow-Cold Packaged Liquid Chiller

Working with architects, engineers and manufacturers on Air Conditioning and Refrigeration since 1919

ACME INDUSTRIES, INC.

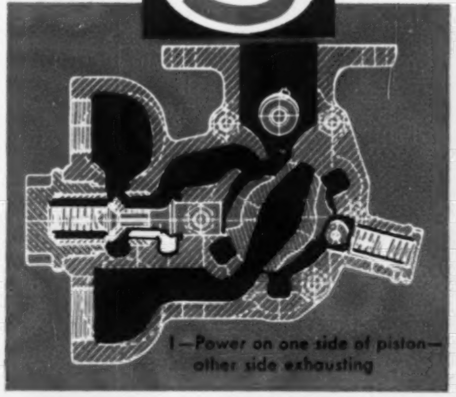
JACKSON, MICHIGAN

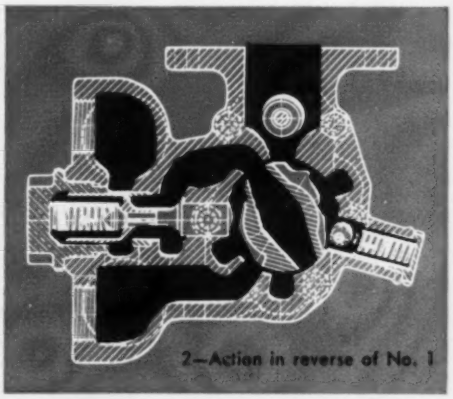
ACME
AIR CONDITIONING
REFRIGERATION

CASH STANDARD

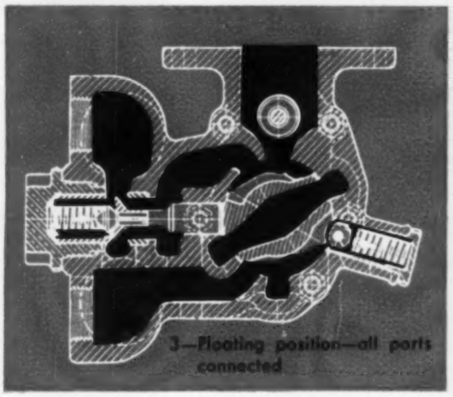
TYPE 555-RO

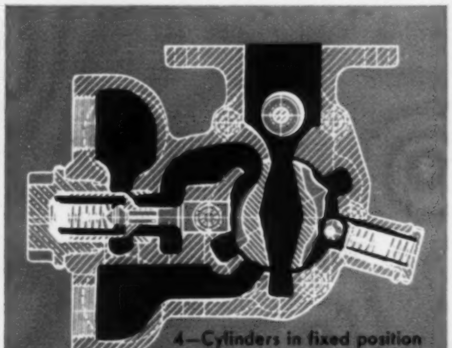
Four-Way Hydraulic Operating Valve


1—Power on one side of piston—other side exhausting


2—Action in reverse of No. 1

a
unique
rotor actuating
hydraulic
valve
with
full floating
position

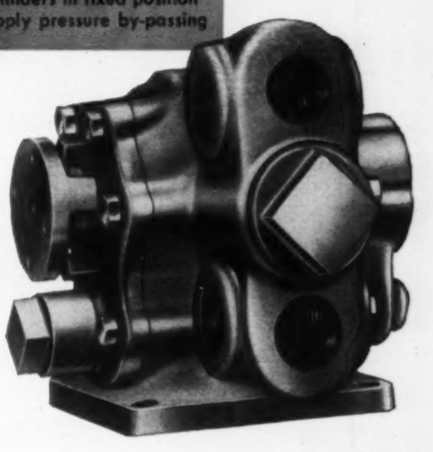

3—Floating position—all ports connected


4—Cylinders in fixed position supply pressure by-passing

A Single Unit For Actuating Hydraulic Equipment

- Actuates one to three hydraulic cylinders
- Designed for 300-1500 psi pressures
- Capacity 400 GPM at 1500 psi
- Built-in by-pass effectively minimizes piston creep
- Design features ball-bearing construction and hardened wearing surfaces
- Rugged construction and precision machining assures easy operation and long service

WRITE today for Bulletin S-600


U. S. Patent No. 2360987

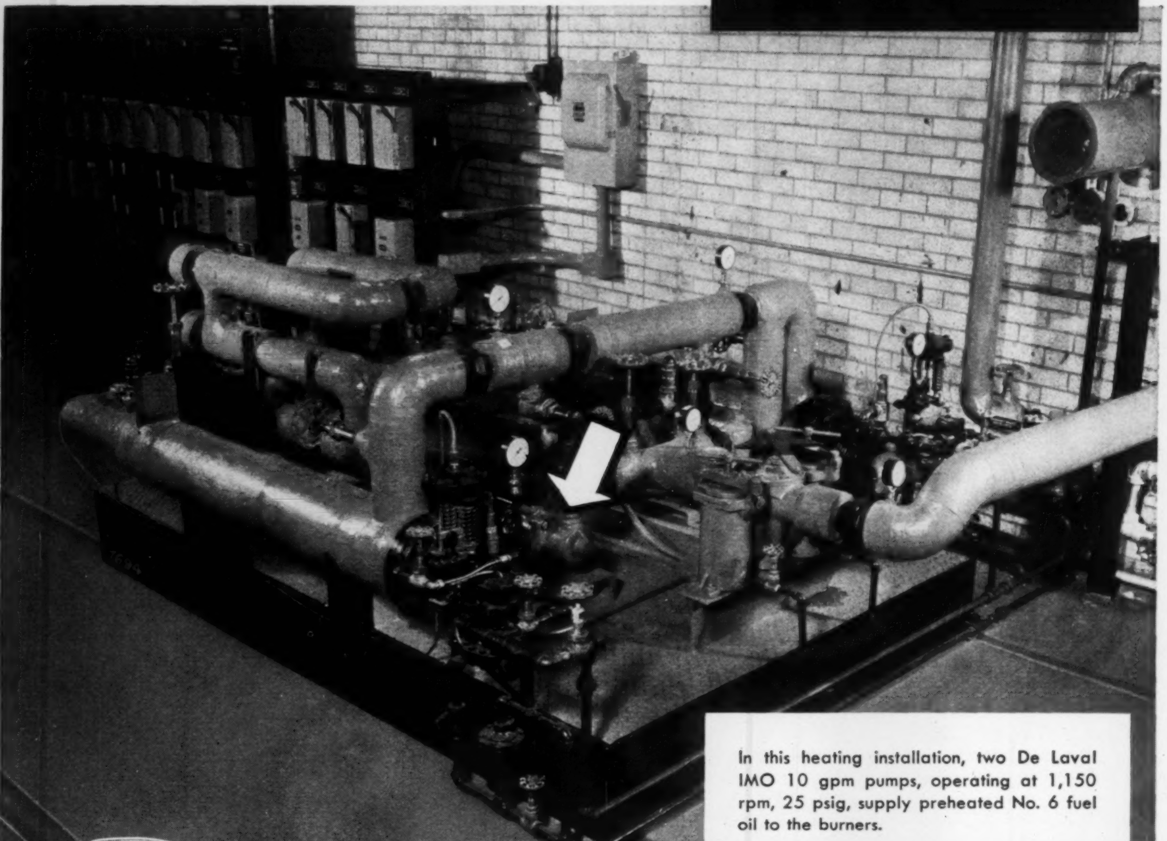
CASH STANDARD

A. W. CASH COMPANY, P. O. Box 551, Decatur, Illinois
Pressure, Hydraulic, Temperature, Process and Combustion Controls

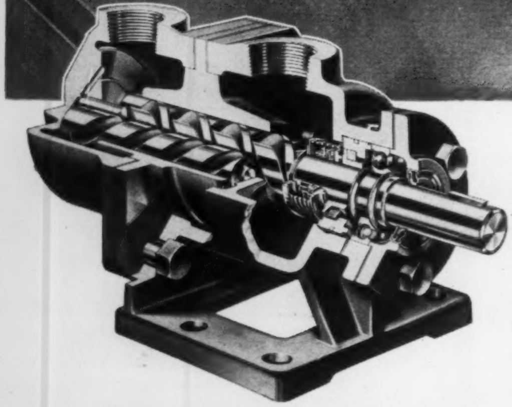
Contracts are more profitable when you install dependable

DE LAVAL

IMO PUMPS



In this heating installation, two De Laval IMO 10 gpm pumps, operating at 1,150 rpm, 25 psig, supply preheated No. 6 fuel oil to the burners.



A wide range of De Laval IMO models specifically built for fuel oil service is available. Capacities up to 80 gpm, pressures to 275 psig. Write today for Bulletin LG-A.

To increase your present—and future—profits on commercial heating jobs, install *dependable* De Laval IMO pumps on pump and heater sets. Their simple, trouble-free design saves you money on service calls . . . builds customer goodwill, for there's nothing to get out of order or need adjustment. No pilot gears, no sliding vanes, no reciprocating pistons. De Laval IMO's have only three moving parts—smoothly intermeshing rotors that propel the fluid axially in a steady flow without churning, pocketing or pulsation.

DE LAVAL *IMO Pumps*

DE LAVAL STEAM TURBINE COMPANY

871 *Nottingham Way, Trenton 2, New Jersey*

DL272

You can see how easily
one man can Apply...

BALDWIN-HILL

MONO-KOVER

ONE PIECE PIPE INSULATION

Its light weight and "snap-on" feature contributes to ease of handling that cuts time and cost on every job. This means bids can be won, and contracts completed well within the allotted time. And MONO-KOVER is outstanding in its resistance to damage or breakage during application.

B-H MONO-KOVER AVAILABLE WITH VAPOR-BARRIER JACKET

Send for MONO-KOVER illustrated bulletin with complete data on how to apply, properties, efficiency, selection help, size and thickness tables.

BALDWIN-HILL COMPANY

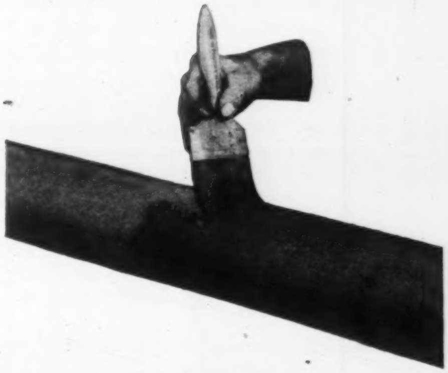
1701 BREUNIG AVE. • TRENTON 2, NEW JERSEY
Kalamazoo, Mich...Huntington, Ind...Temple, Tex.

BALDWIN-HILL BH INSULATIONS

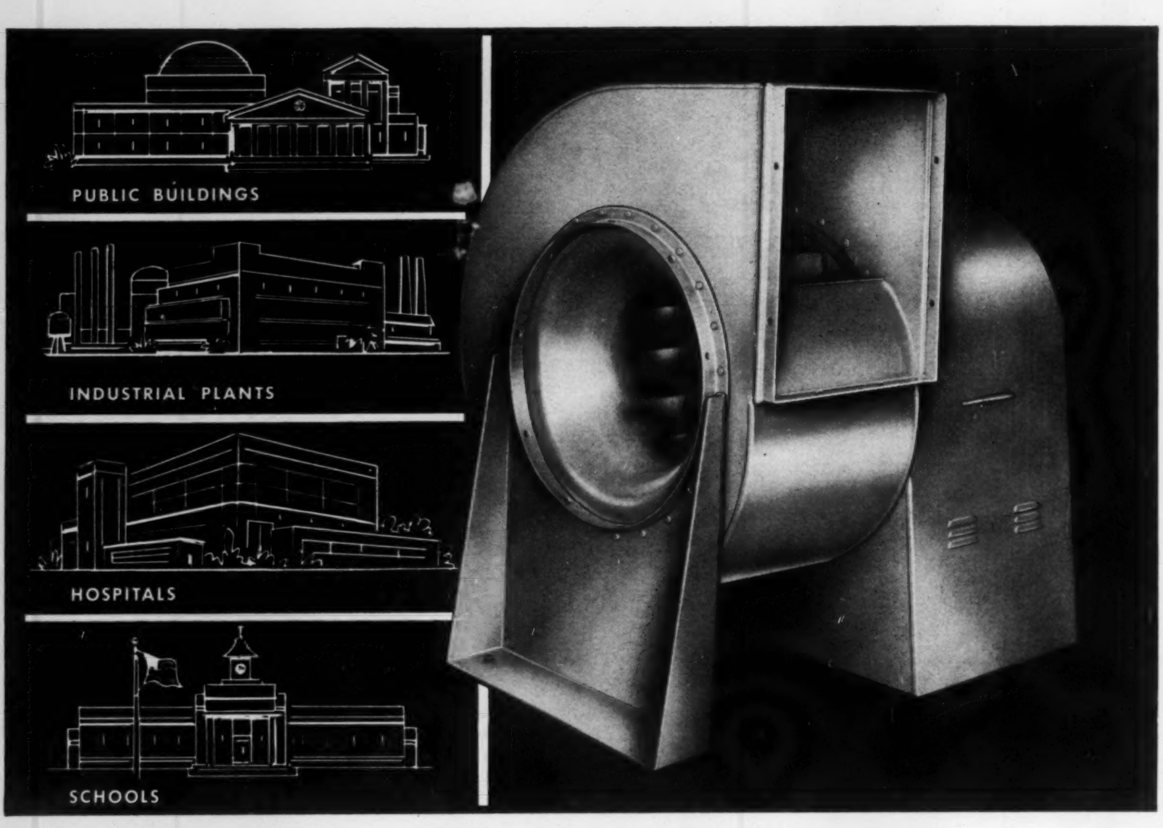
It's a SNAP to Apply

Simply spread each one-piece section at the seam and slip one end over the pipe. Run hands along the MONO-KOVER and it snaps into place to fit snugly around the pipe. Application takes a minimum of effort, saving time and up to 50% in cost.

Press the seam together and apply any standard type of fastening — tape, staples, metal bands, muslin, paste or others. The natural resilience of MONO-KOVER holds it on the pipe so that both hands are free for fastening.



B-H MONO-KOVER can be painted as desired for appearance and to conform with surroundings.



Quiet, Compact Westinghouse Ventilating Sets are Seven Ways Better!

In industrial plants, schools, hospitals, public buildings—wherever quiet, low-cost, reliable ventilation of small to medium areas is required, check the features of Westinghouse Ventilating Sets before you specify. Only Westinghouse offers all seven of these benefits:

1. *Low power consumption*, thanks to wheel designs that combine top efficiency with large capacity
2. *Simple installation* because these compact fan-motor units are miserly with space, easy to set up
3. *Extra-quiet operation* because carefully designed inlets give smooth, steady airflow
4. *Convertible air discharge*—as you want it, when you want it, even after initial installation
5. *Weatherproof covers* that keep these units dry and clean when mounted outdoors
6. *Trouble-free operation* that cuts maintenance, permits installation in out-of-the-way locations
7. *Exclusive warranty* that only Westinghouse-Sturtevant can offer because of undivided equipment responsibility

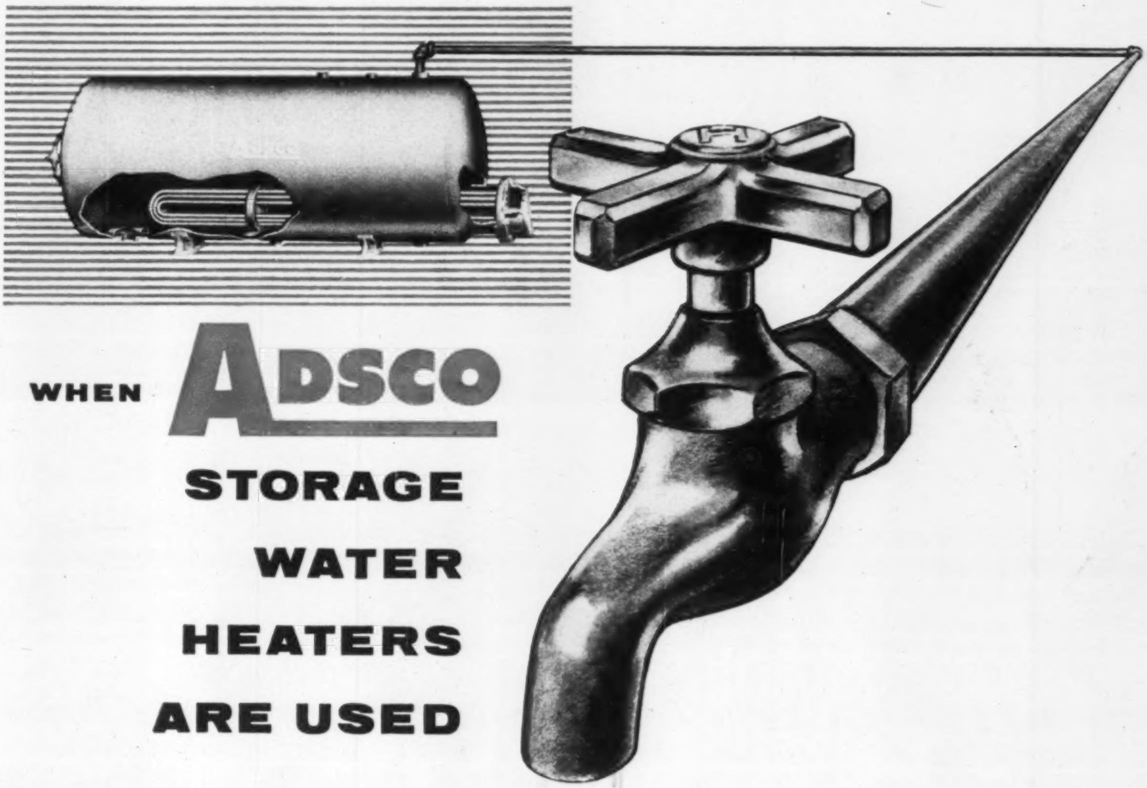
Westinghouse Ventilating Sets are available now either direct-connected for volumes from 150 to 3200 cfm, or v-belt driven (illustrated above) for volumes from 375 to 14,400 cfm. Wheel diameters range from 6 to 30 inches. Ask your Westinghouse-Sturtevant representative for further details. Get catalog 1160. Write: Westinghouse Electric Corp., Sturtevant Division, Hyde Park, Boston 36, Mass.

WESTINGHOUSE AIR HANDLING

YOU CAN BE **SURE** ... IF IT'S **Westinghouse**

J-80409

Plenty of Hot Water on Tap



WHEN ADSCO STORAGE WATER HEATERS ARE USED

Plenty of hot water, when you need it, because ADSCO Storage Water Heaters are generously built to provide their full-rated capacity.

And here is a great new advantage! ADSCO Storage Water Heaters now are being made also at ADSCO's Western Division in Richmond, Cal., the California Steel Products Company. This means faster delivery for ADSCO's western customers as well as lower costs which result from lower freight rates.

ADSCO Storage Water Heaters are manufactured in both horizontal and vertical types. The removable heating element consists of U-shaped seamless copper tubes, roller expanded into a carefully-drilled tube plate. Standard ADSCO tanks are fabricated from flange-quality carbon steel, stainless-clad or nickel-clad steel, or copper-silicon alloy to combat bad water conditions. Tanks can be lined with ADSCO Phenolic No. 6 2 Lining, with ADSCOTE Lining, or they can be galvanized. Materials and workmanship are in accordance with ASME Code requirements.

Write for Bulletin 54-75B-PAC

ADSCO
ENGINEERED
PRODUCTS

AMERICAN DISTRICT STEAM COMPANY, INC.
GENERAL OFFICES
NORTH TONAWANDA, NEW YORK
PLANTS
NORTH TONAWANDA, N. Y. – RICHMOND, CALIF.

The Standard of Comparison

FOR THE HEATING INDUSTRY

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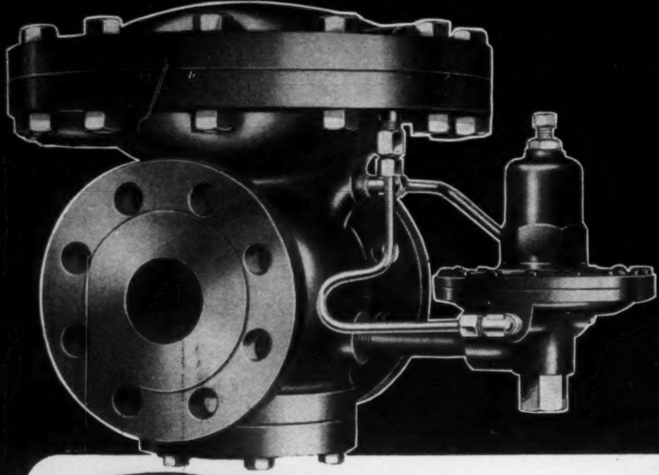

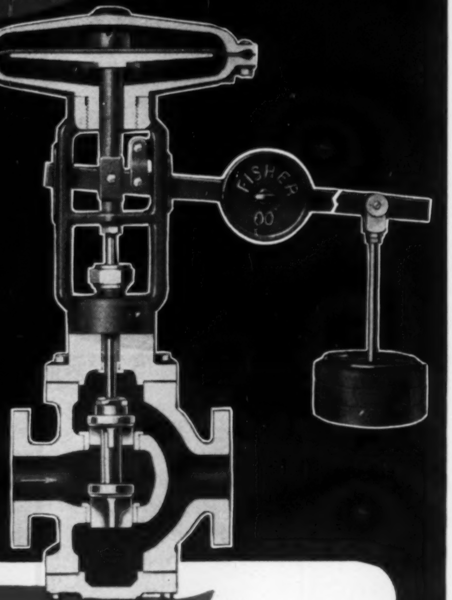

PILOT OPERATED PRESSURE REDUCING VALVE

Built for long dependable service for steam pressure control. The 92A features single seated hardened stainless steel construction, assuring tight closure and preventing excessive pressure build-up. Pilot control maintains desired reduced pressure with remarkable accuracy. Two pilot assemblies for high or low pressure are available and interchangeable.

Sizes ½" to 2" screwed; 1" to 6" flanged. Reduced pressure ranges 3 to 200 PSI. Inlet pressures to 250 PSI at 450°.

LEVER and WEIGHT CONTROLLED PRESSURE REDUCING VALVE

An extremely sensitive, simple yet rugged controller for reducing steam or gas pressures. Double ported globe bodies can be inverted to allow conversion to a relief valve. Swing-link yoke and balanced lever construction permits installation with diaphragm either above or below pipeline.

Sizes ½" to 2" screwed; 1" to 10" flanged. Reduced pressure ranges ½ to 100 PSI. Inlet pressures to 600 PSI at 800° or 1200 PSI at 100°. Bronze or stainless steel trim.

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WORLD LEADER IN THE MANUFACTURE OF PRESSURE REGULATORS AND IN RESEARCH FOR BETTER PRESSURE CONTROL

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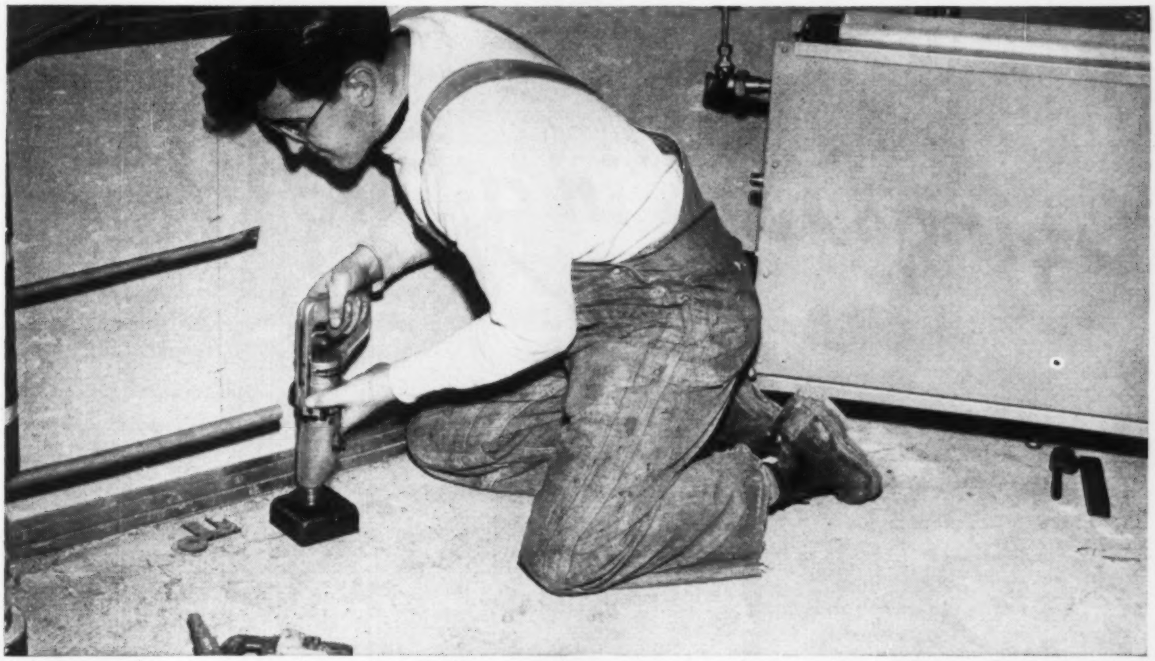
Our 75th

ANNIVERSARY



Cut fastening costs up to 80% on heating and air conditioning installations...with the

REMINGTON STUD DRIVER

"It saves us money on every fixture we install"—that's the kind of report we're getting every day on the Remington Stud Driver. Big savings just naturally result from the amazing speed of this powder-actuated tool. It sets as many as 5 studs a minute in steel or concrete!

You'll find real economy, too, in the fact that the Stud Driver is completely self-powered—no need for extra equipment, wires or cables. Compact and portable, the tool is designed in every way for easy handling. And since it weighs only 6 pounds, it's ideal for working overhead and in confined spaces.

What's your fastening job? Whether it's fastening pipe to walls and ceilings or anchoring fixtures to concrete floors, you'll save money with the Remington Stud Driver. For complete information on how to cut *your* fastening costs, just send in the coupon below.

QUESTIONS YOU ARE ASKING

QUESTION:
What are the studs made of?

ANSWER:
Genuine Remington studs are made of a selected molybdenum-bearing alloy steel, heat-treated for required hardness and ductility properties. All are plated for protection against corrosion.

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Remington Arms Company, Inc.
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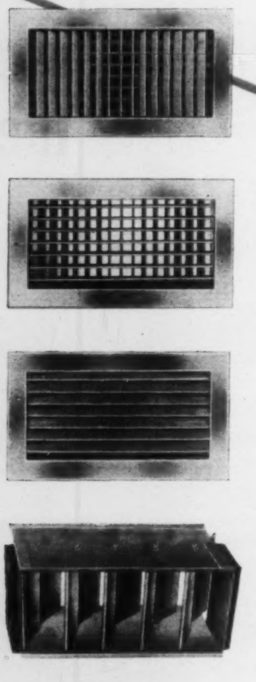

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REGISTERS and GRILLES

As we begin our second year of manufacturing *Air Conditioning Registers & Grilles,* we are proud to count many leaders of the Industry among our representatives, their contractor customers, and approving engineers and architects.

There Must Be a Reason . . .

There is!—Never before has a manufacturer entered this field with the finest in high-production facilities, making possible consistent quality, advanced design, and volume output at competitive prices. Facilities —yes, and organization, too! Investigate the line that's *"Second to None!"*

The Complete QUALITY Line
For Cooling & Ventilating

GENERAL REGISTER
CORPORATION
14 Factory Street Cedar Grove, New Jersey

A NEW LOW IN PUMPING HEAD!

NEW PRITCHARD LOLINE COOLING TOWER DISTRIBUTION SYSTEM ASSURES UNUSUALLY LOW PUMPING HEAD

The new Pritchard *LOLINE* tower distribution system assures an unusually low pumping head with greater economy in pump capacity and power consumption. This unique system is simple, non-clogging, easily cleaned. Splash box assemblies properly distribute incoming water into each distribution basin. Factory machine-drilled orifices in the floor distribute the water uniformly over wood filling at any flow of water within the limits of performance. There are no nozzles to clog or wear out.

As an exclusive optional feature, internal water supply piping terminating in a connection at the base of the tower is available, eliminating exterior water supply piping entirely!

Shown below is an external supply system which is also available as an optional feature.

INDUSTRY'S PARTNER FOR PROGRESS

COOLING TOWERS
AIR COOLED HEAT EXCHANGERS
GAS & AIR TREATING EQUIPMENT

REPRESENTATIVES IN PRINCIPAL CITIES FROM COAST TO COAST

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A DIVISION OF J. F. PRITCHARD & CO.
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LOWEST SILHOUETTE TOWER OF 75 TONS CAPACITY AND UP NOW AVAILABLE!

The Pritchard *LOLINE* Tower is the lowest (7′ 7-11/16″ overall) tower of 75 tons capacity and up now available. The *LOLINE* incorporates many features in its new design which are unique in low silhouette tower construction:

1. Attractive exterior
2. Rugged construction
3. Special water piping arrangement
4. Easy to install and maintain
5. All steel parts galvanized

SEND FOR YOUR COMPLIMENTARY COPY OF THIS NEW TOWER BOOKLET!

New Pritchard *LOLINE* Cooling Tower bulletin describes the many unique design features in detail; contains: cross-sectional drawing, photographs of construction features, capacities, optional equipment. Send for your complimentary copy today!

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There's one sure way to pull the cork on the unused BTU's bottled up in space heaters, unit heaters, condensers, evaporators and water heaters.

Use Wolverine Trufin*—the integral finned tube. It packs m-o-r-e heat transfer surface into small areas—makes space saving units perform like big ones. Trufin is available in copper, copper-base alloys, aluminum, bi-metal and electric-welded steel. Wolverine's Trufin Catalog tells the graphic story. Write for your copy today. WOLVERINE TUBE, 1461 Central Avenue, Detroit 9, Michigan.

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DIVISION OF CALUMET & HECLA, INC.
Manufacturers of Quality-Controlled Tubing
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Wolverine Trufin available in Canada
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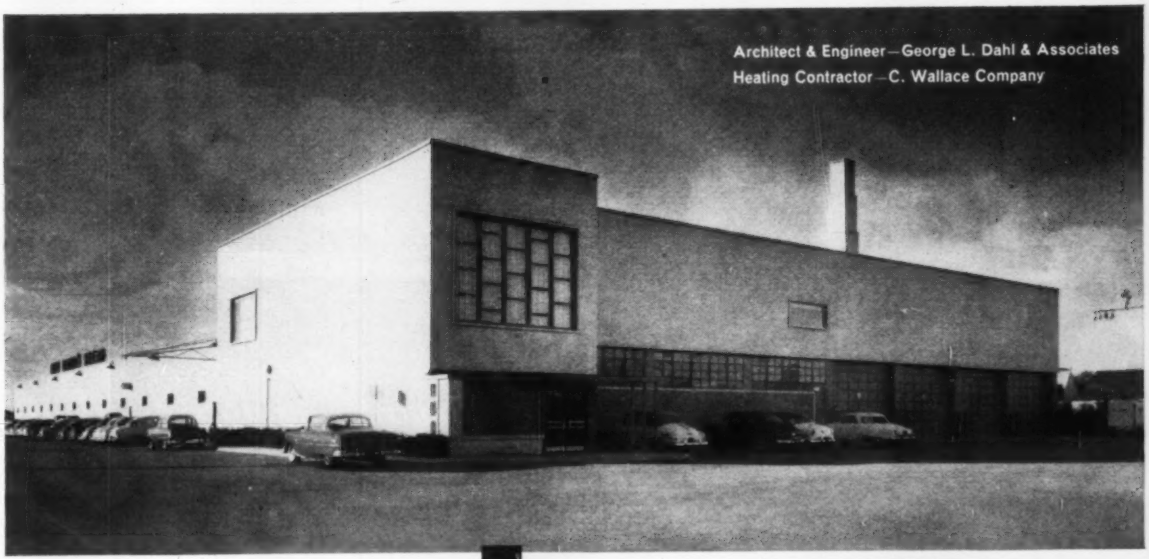
HOW "RESERVE STEAM" HELPS MRS. BAIRD'S BREAD CO. KEEP PACE WITH GROWING MARKETS

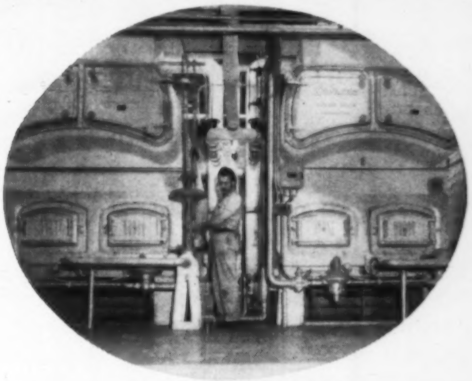


Architect & Engineer—George L. Dahl & Associates
Heating Contractor—C. Wallace Company

KEWANEE reserve plus rated

. . . BOILERS PROVIDE FOR FLUCTUATING LOADS AND FUTURE EXPANSION

It's "full steam ahead" for growth at Mrs. Baird's Bread Co., Dallas, Texas. That's because management looked well into the future in planning the company's modern plant. Take the boilers as an example. Past experience proved that boilers with reserve capacity could economically provide sufficient power to meet the needs of expansion. Kewanee Reserve Plus Rated Boilers were installed, with 50% extra power built in for additional capacity requirements. When fluctuating loads demand more steam at once . . . it's there with Kewanee. When expansion calls for more steam . . . it's there with Kewanee. So, when you consider boilers, don't be misled by promises that a boiler delivers enough steam to meet average daily requirements. Look for reserve to assure performance beyond the call of usual duty. Consider Kewanee Boilers, rated on nominal capacity to operate at "cruising speed". You'll get greater efficiency at lower cost, plus longer boiler life. Only a boiler rated on nominal capacity can make that guarantee.

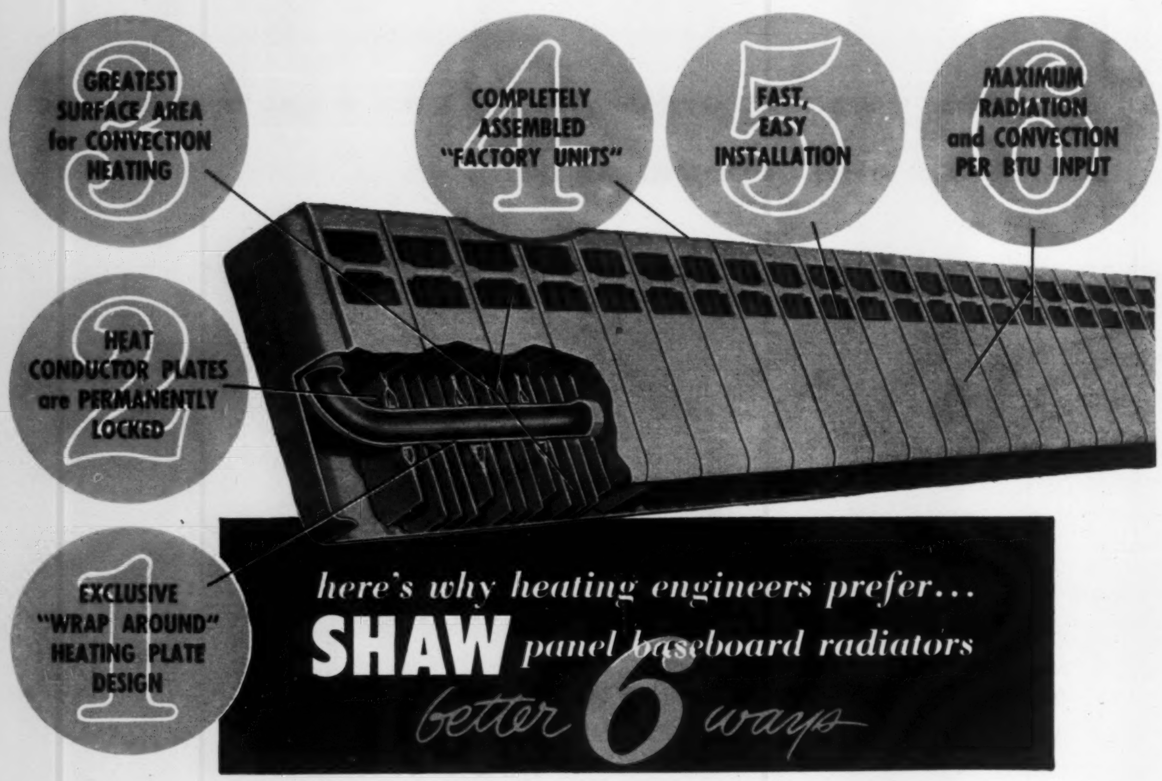


Here are 2 Kewanee No. 5188 Boilers installed at Mrs. Baird's Bread Co.

KEWANEE BOILERS

KEWANEE-ROSS CORPORATION, Kewanee, Illinois
Division of American Radiator & Standard Sanitary Corporation
Serving home and industry American-Standard · American Blower · Church Seats & Wall Tile · Detroit Controls · Kewanee Boilers · Ross Exchangers · Sunbeam Air Conditioners

YOU can depend on KEWANEE engineering


GREATEST SURFACE AREA for CONVECTION HEATING
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COMPLETELY ASSEMBLED "FACTORY UNITS"
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FAST, EASY INSTALLATION
5
MAXIMUM RADIATION and CONVECTION PER BTU INPUT
6
HEAT CONDUCTOR PLATES are PERMANENTLY LOCKED
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EXCLUSIVE "WRAP AROUND" HEATING PLATE DESIGN
1

here's why heating engineers prefer...

SHAW *panel baseboard radiators*

better 6 ways

Specify... SHAW

for a perfect ratio of convection-radiant *Air-e-ated* heat

The men who deal in BTU's have recognized the tremendous plus-values of Shaw's engineered panel baseboard radiators. The need for rugged and efficient heating equipment in Schools, Hospitals, Churches, Factories, Offices, Ships and in the Home is fully met with Shaw's new high standard in quality heating.

Shaw's Air-e-Ated panel baseboard radiators set the pace for beauty and modern design that can readily be made to blend or harmoniously contrast with the functional decor of the modern home or office.

Let us show you how Shaw's Air-e-Ated heat can give new living comfort with the highest *quality* heat and at the lowest BTU cost input. Insist on the best . . . Shaw-Perkins for efficient long-life, beauty and versatility.

1 Exclusive "Wrap Around" heating plate design provides positive lock-contact with copper coil for maximum heat conduction . . . without weakening or prestressing coil.

2 Heat conductor plates are permanently locked to all sides of sidewalls. This provides maximum radiation by eliminating insulating air barrier between convection plate and radiation surface. Fast, quiet heat . . . plus extreme rigidity.

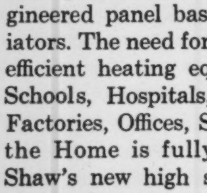
3 Greatest surface area for convection heating. Conductor plates run entire height and depth of every unit and are spaced ½" apart for maximum air circulation and minimum dust matting. Each lineal foot of Shaw Unit provides over 8 square feet of heating surface.

4 Completely assembled "factory units" are all 8" high and only 3" thin. Any number of factory units are easily and quickly joined to form length desired. Straight run, inside and outside corner radiators with three tapping arrangements for right or left and opposite end supply and return piping connections . . . all join simply to provide a modern, beautiful design.

5 Fast, easy installation. Rugged factory units are easily joined into one complete radiator . . . no cutting to length . . . no parts to screw together . . . nothing to rattle. Impervious to high pressures, vibration and thermal expansion. Just screw to wall and connect supply and return ends to steam or hot water supply.

6 Maximum radiation and convection per BTU input. Rating—6.7 square feet E.D.R. average per lineal foot based on 1# steam and 65° F. inlet air. Exclusive Shaw heavy-duty construction and wide spaced, dust-proof plates, assures you of highest heating efficiency that will not change through long years of service.

See our complete listing in Sweet's Catalog.



SP-1

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SHAW-PERKINS
MANUFACTURING CO.
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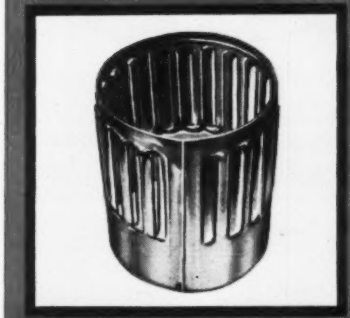
Offices in principal cities

Because of Western ROLL-BOND

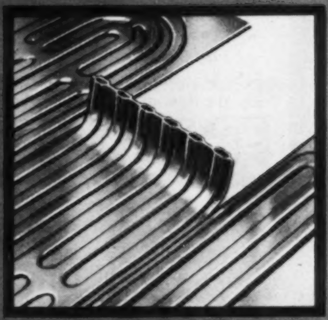
It is now possible to make these and many other products without dies and with an almost unbelievable saving of time and money.

Here are a few examples of metal working possibilities using WESTERN roll-bonding

Wrap around heat exchanger for sirocco type blowers. Tubes immediately adjacent to extended secondary surface.



Three layer design with two completely separate circuits.



Evaporator design showing multiple parallel tube passages—cut out to show tubular cross section and bending.

- Air conditioning evaporators and condensers
- Containers
- Doors
- Flooring
- Furniture
- Home freezer evaporators
- Immersion heaters
- Oil coolers
- Picture frames
- Plate heat exchangers
- Radiators
- Radiant heating units
- Refrigerator evaporators
- Reverse counterflow heat exchangers
- Solar heat collectors
- Structural shapes
- Systems for portable heaters
- Wall panels
- Water coolers

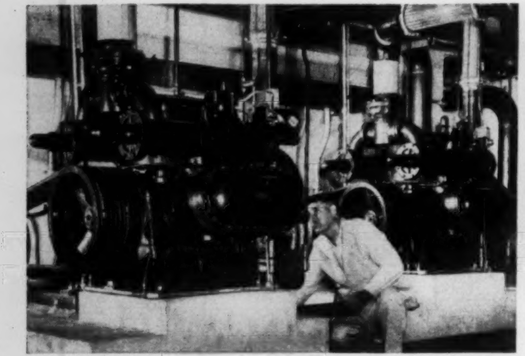
. . . and many more

Free! Actual Sample of Western Roll-Bond Process Metal

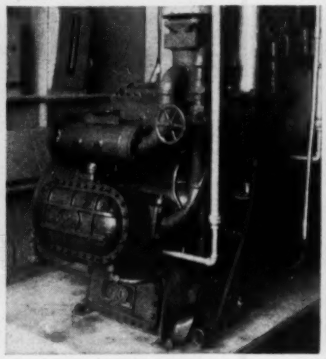
Management, Engineering and Production men frequently ask for an actual piece of Western Roll-Bond Process Metal. Western Metals will be happy to supply samples on request. Write to Roll-Bond Process, Dept. G, Western Brass, East Alton, Ill.

Western
metals division
OLIN MATHIESON CHEMICAL CORPORATION
PLANTS • EAST ALTON, ILL.—NEW HAVEN, CONN.

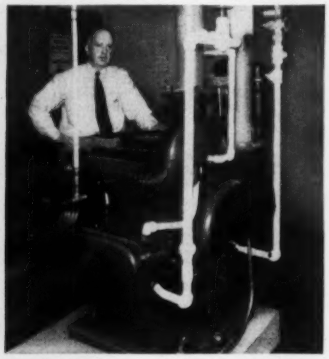
Frick "ECLIPSE" Type PF compressors, built in six sizes up to 150 H.P. and having 2, 3, 4, 6 or 9 cylinders, may be used with any refrigerant at any temperature. They are ideal for such work as air conditioning, marine service, watercooling, food storage and processing.

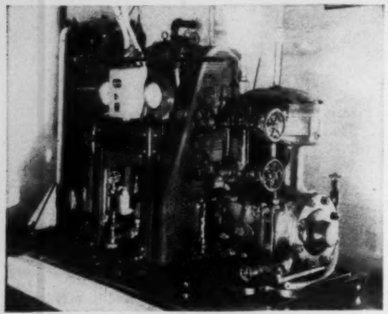


"ECLIPSE" Type AHP compressors are available for regular ammonia service under high operating pressures. These heavy-duty machines are built in three sizes with 3, 6, or 9 cylinders of 3½" bore and 4¼" stroke.



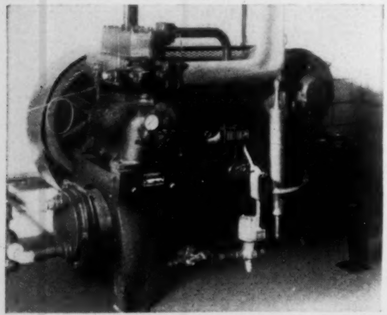
"ECLIPSE" Type PAB booster compressors, built in six sizes, are noted for their dependability and efficiency. Small frosted lines cool the cylinder valve plates with direct-expansion refrigerant—a patented Frick feature.





Combined ammonia units are manufactured in three sizes ranging from 2½ to 10 tons of refrigeration. They are a popular choice for food service, cooling drinking water, making ice, dairy plants, etc.

Frick low pressure units are built in 36 sizes from ¼ to 15 hp. Condensers on smallest machines are air cooled; on intermediate sizes, air or water cooled; and larger sizes, water cooled.



FRICK COMPRESSORS

the Refrigeration Industry's Most Comprehensive Line

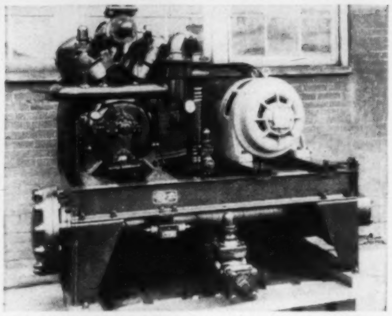
83 Types & Sizes

When you specify Frick machines you have the widest choice of models, and are sure of getting a compressor exactly suited to your needs.

Are you handling one of the Freons, or ammonia, or some other refrigerant? At what temperature? Whatever your load, there's a Frick machine built to meet every commercial and industrial requirement.

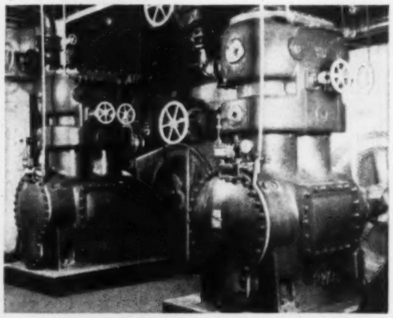
Tell us about your cooling work, and we'll send you the full facts and figures on Frick equipment to match the job. Branches and Distributors in principal cities, or write directly to

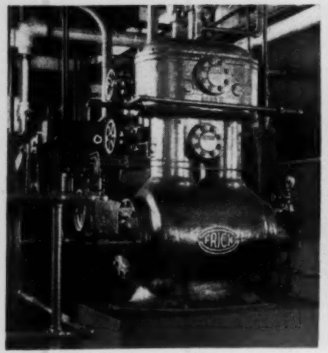
DEPENDABLE REFRIGERATION SINCE 1882
FRICK Co.
WAYNESBORO, PENNA. U.S.A.



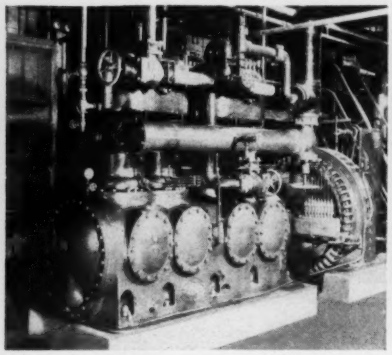
"ECLIPSE" Type PF low pressure units are furnished in 15, 20, 30, 40 and 60-hp. sizes. Shell-and-tube coolers may be added to form compact water chilling units.

Frick Company pioneered the development of the booster compressor. Since 1929 these Type FB machines, built in seven sizes, have been regularly installed by ice cream and quick freezing plants all over the world.

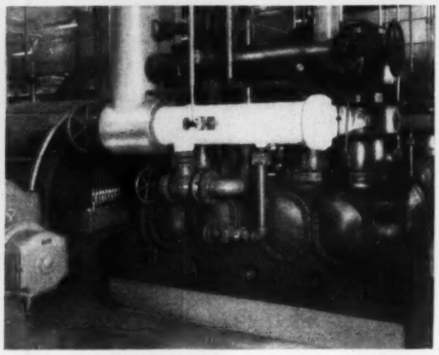




Frick two-cylinder enclosed Type V.S.A. ammonia compressors have been perfected over the past 40 years, until today they are the standard of the industry. They are available in capacities from 2 to 300 tons, in 11 sizes.

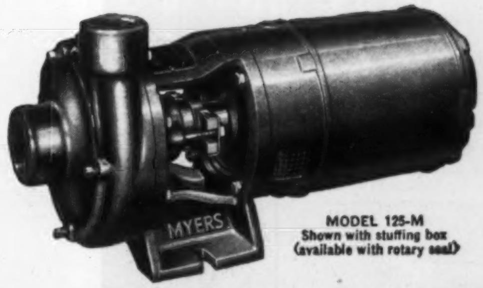


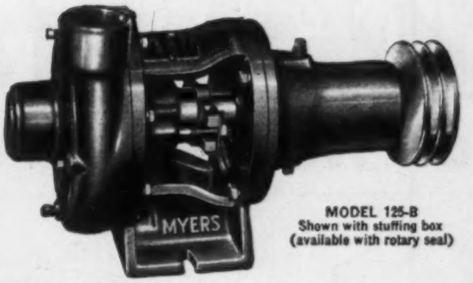
Four-cylinder Type V.S.A. enclosed compressors are normally offered in four sizes with capacities up to 800 tons. Furnished with capacity controls on each cylinder, these machines give the user maximum flexibility and durability on heavy-duty refrigerating service, such as in the food and chemical industries.



Frick four-cylinder Type FB enclosed V.S.A. ammonia booster and Freon-12 compressors are available in 15" by 10" and 17¾" by 12" sizes. Seabrook Farms, the world's largest quick-freezing plant, has eight of the larger size.

Frick Dependable Refrigeration Since 1882


MODEL 125-M
Shown with stuffing box
(available with rotary seal)


MODEL 125-B
Shown with stuffing box
(available with rotary seal)

NOW... a complete line of centrifugal pumps for air conditioning application from MYERS, the greatest name in domestic and farm pumps

MODEL 100-B
Rotary seal only

MODEL 100-M
Rotary seal only

FULL RANGE OF SIZES
⅓, ½, ¾, 1, 2, and 3 horsepower, motor-mounted or belt-driven models.

TWO CASING SIZES
1″ x 1¼″ or 1¼″ x 1½″.

ALL-BRONZE IMPELLER
Accurately balanced for smooth operation.

REMOVABLE BRONZE WEARING RINGS
Easily replaced for longer pump life.

ROTARY SEAL
Eliminates leakage (stuffing box may be specified on some models.)

CORROSION-RESISTANT SHAFT
Stainless steel for trouble-free service.

CAPACITOR-TYPE MOTORS WITH BUILT-IN OVERLOAD PROTECTION
Available in single or dual voltage for single or 3-phase current.

WIDE RANGE OF CAPACITIES AND HEADS
Models with capacities to 85 GPM and heads up to 135 feet.

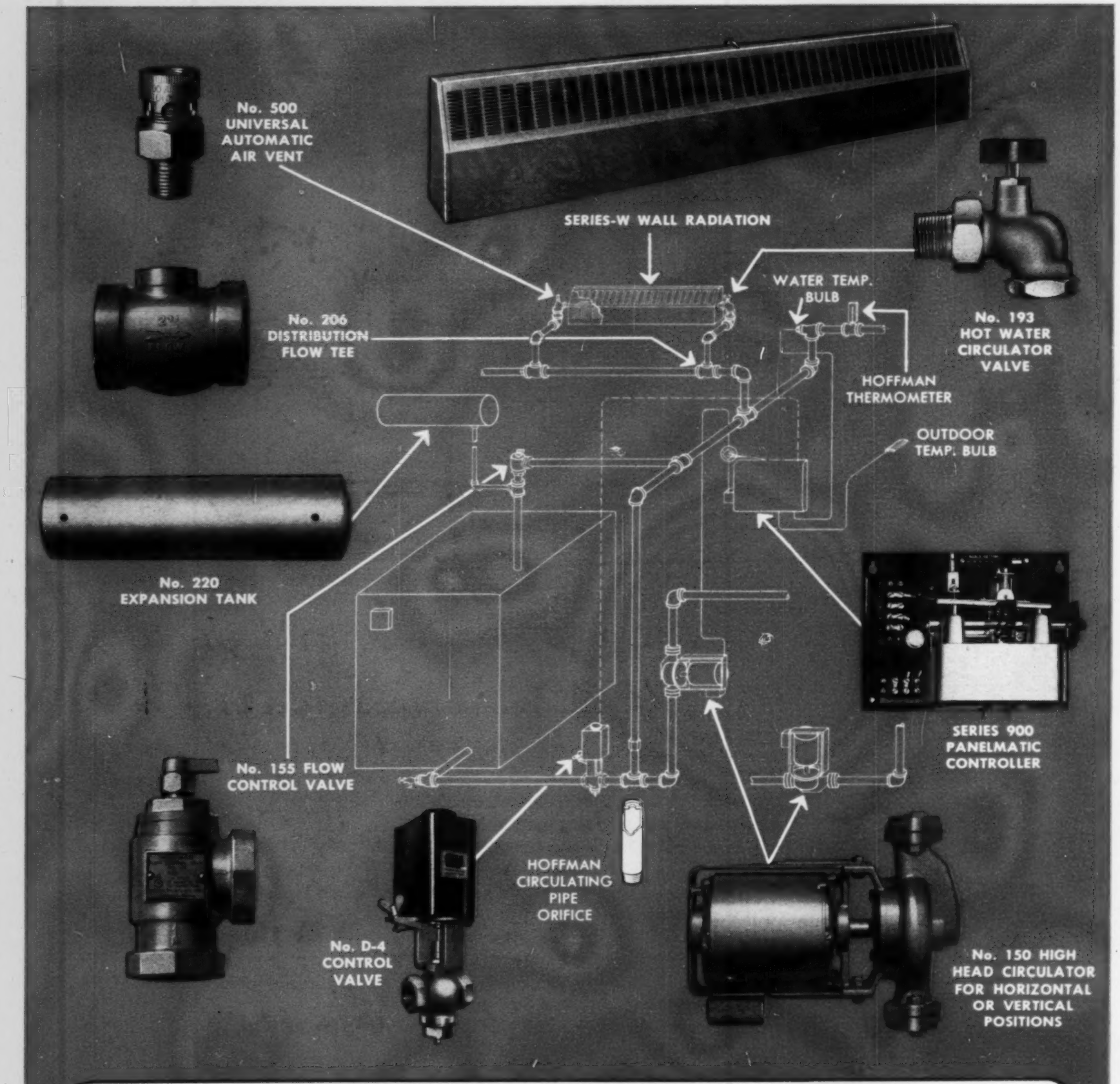
Myers

Write today *for performance curves and Bulletin M-787 on Myers Centri-Thrift Pumps.*

Myers **PUMPS** WATER SYSTEMS AND WATER SOFTENERS

The F. E. Myers & Bro. Co. • Dept. HP-3, Ashland, Ohio

HOFFMAN COMPLETE EQUIPMENT FOR HOT WATER HEATING SYSTEMS


No. 500 UNIVERSAL AUTOMATIC AIR VENT
SERIES-W WALL RADIATION
WATER TEMP. BULB
No. 193 HOT WATER CIRCULATOR VALVE
No. 206 DISTRIBUTION FLOW TEE
HOFFMAN THERMOMETER
OUTDOOR TEMP. BULB
No. 220 EXPANSION TANK
SERIES 900 PANELMATIC CONTROLLER
No. 155 FLOW CONTROL VALVE
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No. D-4 CONTROL VALVE
No. 150 HIGH HEAD CIRCULATOR FOR HORIZONTAL OR VERTICAL POSITIONS

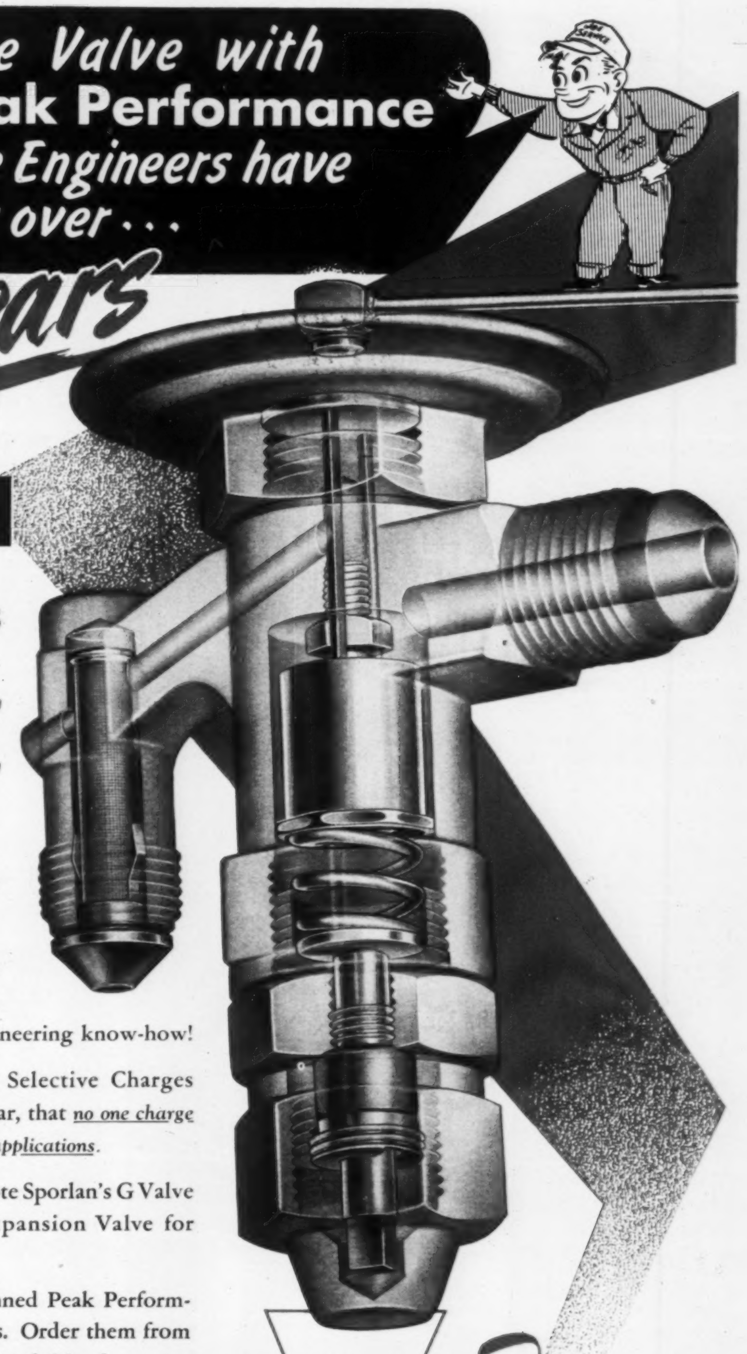
EVERY HOT WATER SPECIALTY YOU NEED—from ONE COMPLETE LINE

Now you can specify Hoffman products for every spot on a hot water heating system—with three important advantages to you. First, you are assured uniform operating efficiency; second, it saves time from buying to billing; third, it provides one uniform guarantee from a single, recognized source. And, in addition, builders are quick to appreciate the sound Hoffman design features that cost no more than ordinary kinds. New Bulletins on High Head Circulators, Flow Control Valves, Expansion Tanks, Flow Tees, Circulator Valves and Wall Radiation are available, free, no obligation.

HOFFMAN SPECIALTY MFG. CORP. • 1700 West 10th Street, Indianapolis 22, Indiana
Makers of Valves, Traps, Hot Water Heating Systems, Vacuum and Condensation Pumps . . . Sold by Leading Wholesalers of Heating and Plumbing Equipment

Here's the Valve with
Planned Peak Performance
that Service Engineers have relied on for over . . .

21 years



The

SPORLAN
G VALVE
WITH SELECTIVE CHARGES

C CHARGE
for Suction Temperatures above Zero

Z CHARGE
for Suction Temperatures below Zero

X CHARGE
for Extremely Low Temperatures

• • • and the reasons for Sporlan's great reliability are *two-fold.*

There has been just one Sporlan design, never changed, but constantly improved by 21 years of engineering know-how!

And Sporlan has *always* offered Selective Charges which keep on proving, year after year, that *no one charge* can properly operate a valve on *all applications*.

No wonder Service Engineers vote Sporlan's G Valve the number one Thermostatic Expansion Valve for commercial refrigeration!

You, too, can rely on Sporlan's Planned Peak Performance G Valves with Selective Charges. Order them from your wholesaler today, and be sure to ask him for a new Sporlan Catalog, showing the proper Solenoid Valves and Catch-Alls to go with them.

Remember . . . *Buy Sporlan*
Right-Down-The-Line and get
Peak Performance throughout!

SPORLAN *Valve Co.*

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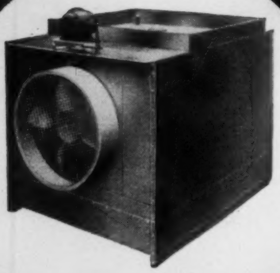


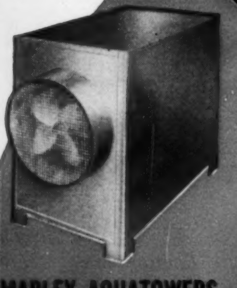
MARLEY AQUATOWERS
(large capacity)

MARLEY AQUATOWERS
(medium capacity)

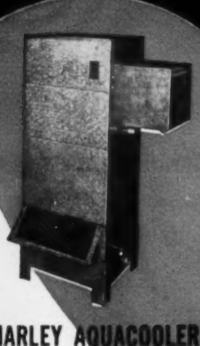
to get a line on

Modern Water Cooling

Dial M
FOR
MARLEY



MARLEY AQUATOWERS
(small capacity)



MARLEY AQUACOOLER

MARLEY SPRATOWER
(Natural Draft)

MARLEY REDWOOD AQUATOWER

**Call your local
Marley application engineer for
complete information on these towers.**

"Dial M" for Marley—and you've got a direct connection to the world's most complete, most original line of water cooling towers for air conditioning and refrigeration. You have a direct wire, too, to the world's most *profitable* line of cooling towers—for Marley's the line that eliminates service headaches, call-backs, and kick-backs.

So just dial Marley—and state your problem. Need a tower for indoor installation . . . or outdoor? Must it comply with fire codes? Any special corrosion problem? No matter! In the Marley line there is a tower to meet every service condition and every capacity requirement.

Best of all, Marley towers are available when and where you need them. Stocks are maintained in all important cities. Just dial Marley—and a trained Marley engineering representative will assist you without obligation in solving any cooling tower problem that arises.

MARLEY AQUATOWERS*

Marley Aquatowers are the acknowledged standard of the air conditioning and refrigeration industries—the most imitated products in the field. But the 1955 Aquatowers contain numerous features that can't be copied—new design compatability, new harmony with surroundings, a new standard of performance. Now Aquatower styling features the same eye-appealing appearance found in other consumer appliances. In some models all projecting parts are covered; covers and intake screens are available. Higher performance and simplified service are engineered into all models. For larger installations, Marley Aquatowers feature all-bolted construction to facilitate hoisting, handling and assembly. Aquatowers are built in 11 sizes to serve air conditioning equipment in a wide range of capacities.

MARLEY AQUACOOLER†

A companion to the Marley Aquatower and the newest tower to complete the Marley line is the Aquacooler*, an induced draft, counter-flow tower. New Aquacoolers can be installed indoors or out. Venting discharged air is very simple and external static pressure is overcome by the centrifugal fan. They are available in 5 sizes for service ranging from 3 to 15 tons.

Marley engineers have spared no details to make the Aquacooler the best tower equipped with centrifugal blower type fan. Typical of the quality built into this new tower are these features: A balanced spray system equipped with patented Marley cast bronze two-piece nozzles . . . nailless MarPak* type filling, fabricated from select heart quality redwood . . . centrifugal type blower fan, hot-dipped-galvanized after fabrication . . . all interior surfaces coated with corrosion resistant Marmastic undercoating.

†AQUACOOLER is the exclusive trade mark of the Marley Company.

MARLEY REDWOOD AQUATOWER*

The new Marley Redwood Aquatower is the first packaged cooling tower to utilize the forced-draft, cross-flow vertical discharge principle. The new tower is designed especially for localities where corrosion is a problem. Because of the forced-draft design, mechanical equipment is removed from the hot, humid air stream. The all-redwood construction is highly resistant to corrosion and its appearance is enhanced by attractive redwood resin stain.

MARLEY SPRATOWERS*

For top cooling performance at rock bottom cost, there is nothing like a Marley SpraTower. Every structural member of these rugged towers is of heart quality redwood. Spray nozzles are Marley's own patented non-clog design. For smaller units the basin is pre-assembled to facilitate erection.

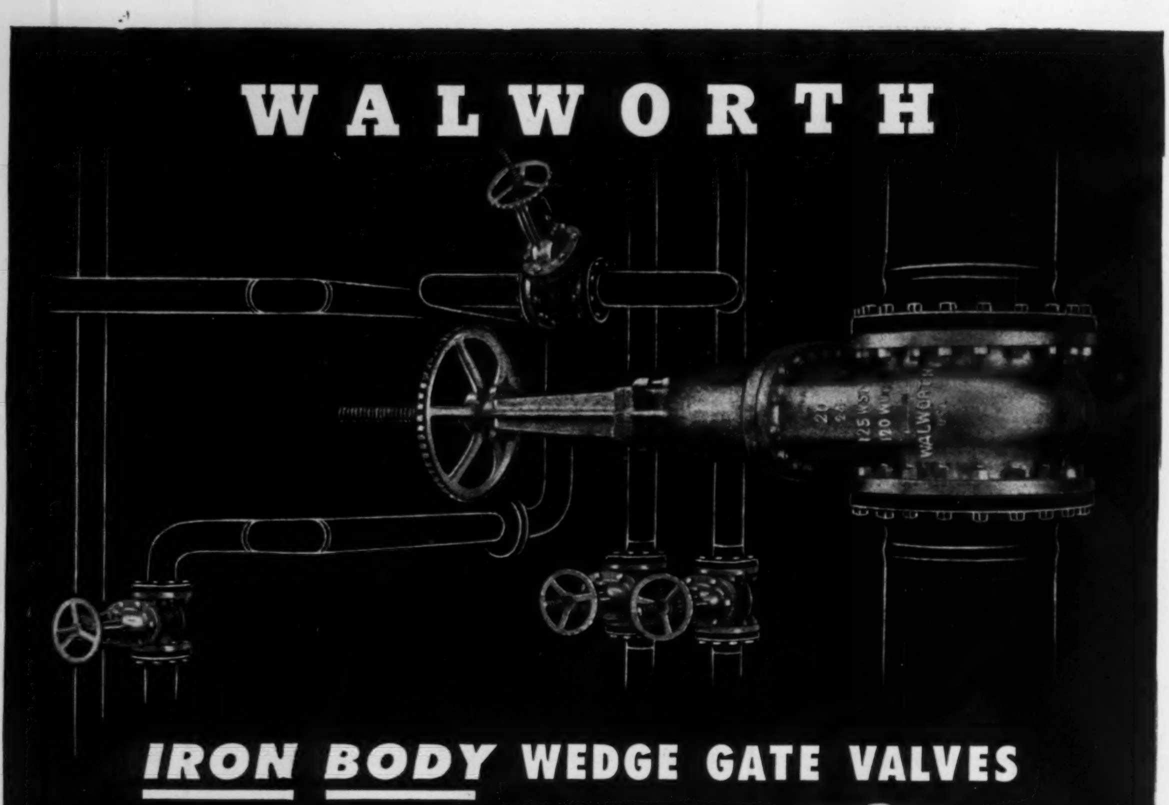
Series 200 SpraTowers are built in expandable standardized units for any capacity service, and are also available with atmospheric sections. They feature the same rugged simplicity and economical operation as Marley's smaller towers.

*Trademark Registered

MARLEY ®

The Marley Company

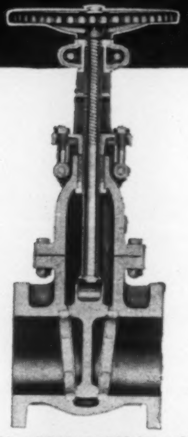
Kansas City, Missouri



Better because **...The entire valve, from handwheel to seat rings, is ruggedly constructed to withstand rough and frequent usage. Body, bonnet, and yoke are sturdy castings with large radius fillets. Dimensions and drilling of end flanges are in agreement with American Cast Iron Flange Standards. Stiffening ribs connect end flanges with the body neck to maintain a rigid connection with piping.**

A wide range of Walworth Iron Body Wedge Gate Valves is available—through your Walworth Distributor—from which you can choose the right type to meet your most exacting conditions. Saddle-type valves as small as ¼-inch; low pressure valves for water and gas pipelines up to 36 inches.

Whenever you need valves and fittings, choose from complete lines—in a variety of metals—manufactured by Walworth. For more information, see your Walworth Distributor or write: Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.



Walworth No. 726F OS&Y (Outside Screw and Yoke) Iron Body Wedge Gate Valve. OS&Y valves are recommended for services where it is desirable that the line fluid does not come in contact with the stem threads. Note the swing-type gland-eye-bolts for easy repacking. Sizes 2 to 30 inches.

WALWORTH

Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

60 East 42nd Street, New York 17, N. Y.

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HERE is the 4″ DEEP BED OIL-FREE PERMANENT-TYPE

DYCON AIR FILTER

THE NEW CA-20

Choice of various media blankets to provide degree of efficiency desired.

Exceptional Dust-Holding Capacity: traps and holds dust by accumulated static charge . . . like all Continental DYCON filters, CA-20 *cuts maintenance costs,* because you . . .

just RINSE and REUSE!

DYCON CA-20 **and**
DYCON CA-24 **(8″ deep bed)**

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INDUSTRIAL AIR FILTRATION
CENTRAL SYSTEM AIR CONDITIONING

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WARM AIR FURNACES
AIR CONDITIONERS
AIR-HANDLING UNITS

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CONTINENTAL AIR FILTERS Inc.

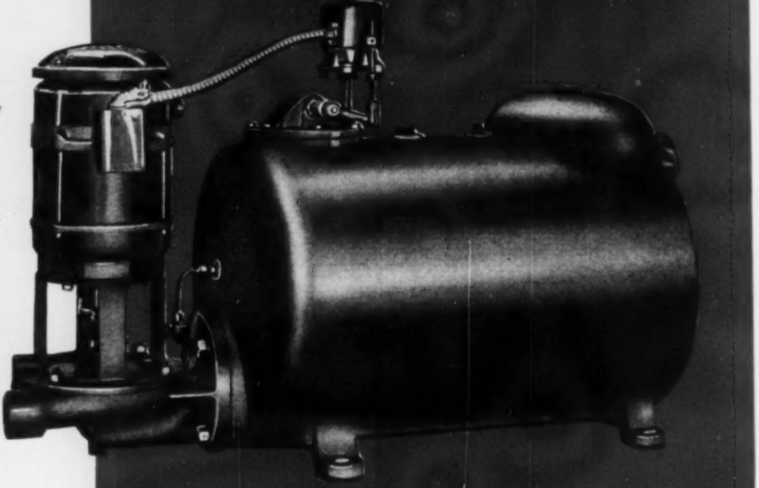
SKIDMORE PUMPS

for every installation

MAINTAINED
SKIDMORE
PUMPS
EFFICIENCY

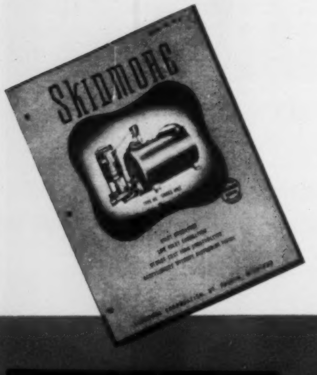
TYPE "VC"

QUIET OPERATION
LOW INLET
CONNECTION
EASILY ACCESSIBLE



SINGLE UNIT — also available in duplex.

YOUR COPY — Send today for bulletin 10-B. Complete information and engineering data are enclosed.



Designed by men who really know pumps . . . men who have had years of experience in the field—the "VC" Condensation Pump is built for rugged and dependable service. Like all SKIDMORE PUMPS, the "VC" Unit is correct in every detail . . . yet simple in construction —assuring ease of accessibility and a minimum of wear. Specify a SKIDMORE PUMP on that next job . . . there's one for every installation.

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SKIDMORE
PUMPS

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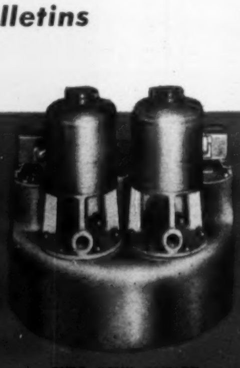
TYPE "UV"

TYPE "[illegible]"



TYPE "CV" DUPLEX

Here's the versatile, economical way to heat any building...

TEMTRIM FINNED TUBE RADIATION

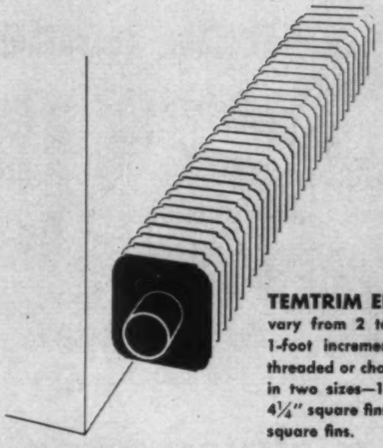
- ***Low cost***
- ***High heat output***
- ***Easy installation***
- ***Compact size***

● TEMTRIM is a welded steel pipe that bristles with steel radiating fins. It has a big, high-output heating surface, yet it is compact. Mounted on the wall, Temtrim projects only between 3 to 5 inches into the room.

TEMTRIM is economical to buy and install. Lengths of Temtrim can be connected and hung on wall brackets in a matter of minutes. Can be used with either hot water or steam systems for any type installation.

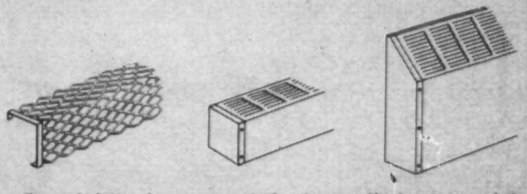
TEMTRIM can be installed with fins exposed, or with one of three attractive covers: expanded metal, louvered flat top or sloping louvered top. These sturdy steel covers are bonderized and finished with a gray prime coat.

With the addition of Temtrim, American-Standard offers a complete line of radiation for commercial and residential application. Included in the line are ferrous and non-ferrous baseboard panels and convectors and cast iron radiators, as well as remote type heating-cooling units. For information about Temtrim, mail coupon to **American Radiator & Standard Sanitary Corp.,** Dept. HP-114, Pittsburgh 30, Pa.

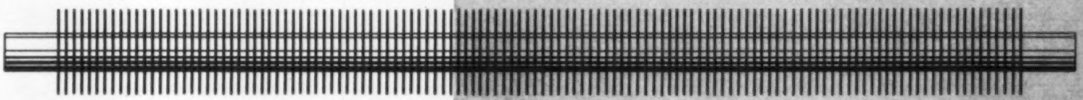


TEMTRIM ELEMENT LENGTHS vary from 2 to 12 feet in convenient 1-foot increments. Pipe ends can be threaded or chamfered. TEMTRIM comes in two sizes—1¼" I.P.S. with 3¼" or 4¼" square fins and 2" I.P.S. with 4¼" square fins.

TEMTRIM COVERS are handsome and easily attached.



Expanded Metal | Louvered Flat Top | Sloping Louvered Top



TEMTRIM FINS are mechanically bonded to the pipe. They won't work loose.

AMERICAN-Standard
HOT WATER HEATING

American-Standard
Dept. HP-35, Pittsburgh 30, Pa.

Please send me literature on TEMTRIM.

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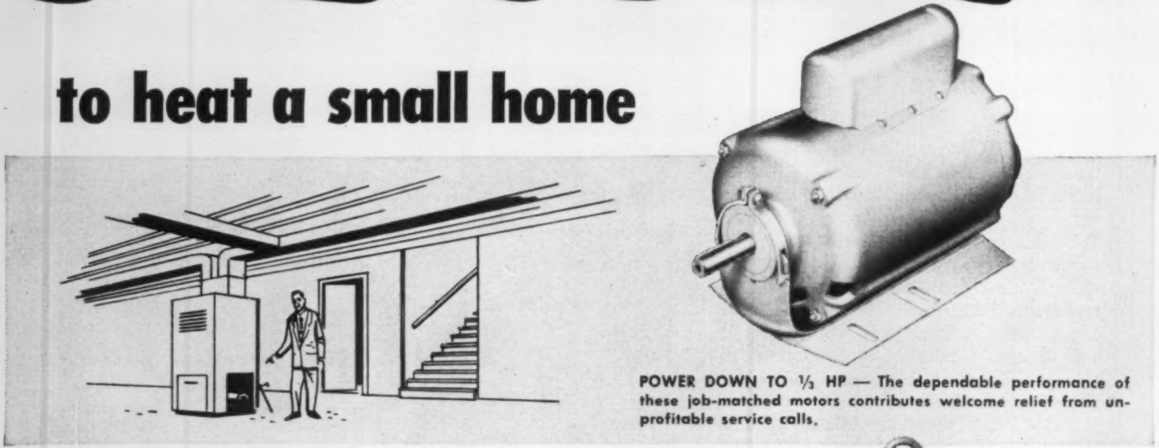
Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

APPLICATION-ENGINEERED

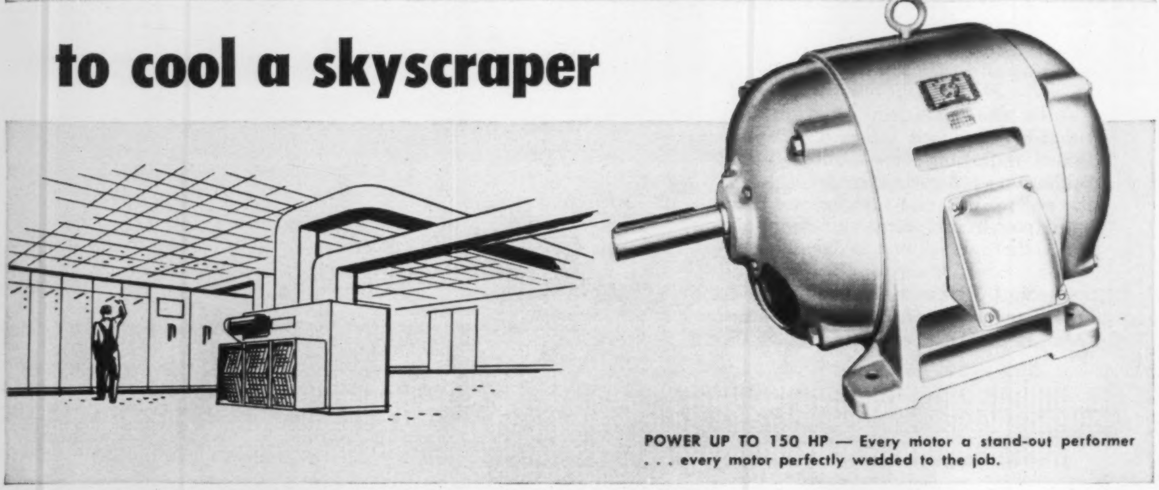
POWER

to heat a small home



POWER DOWN TO 1/3 HP — The dependable performance of these job-matched motors contributes welcome relief from unprofitable service calls.

to cool a skyscraper



POWER UP TO 150 HP — Every motor a stand-out performer . . . every motor perfectly wedded to the job.

A. O. SMITH* FRACTIONAL AND INTEGRAL horsepower motors

Leading manufacturers of quality heating and air conditioning equipment depend on A. O. Smith motors to uphold their good names.

Produced by one of America's great industrial concerns, these motors are backed by a national network of 260 strategically located factory service stations. There's one near you — ready to provide 24-hour action on all parts and service orders.

Write today for facts about A. O. Smith quality line of motors.

*Made by the makers of America's *first* glass-lined water heater—Permaglas.

Through research . . . a better way

A.O.Smith
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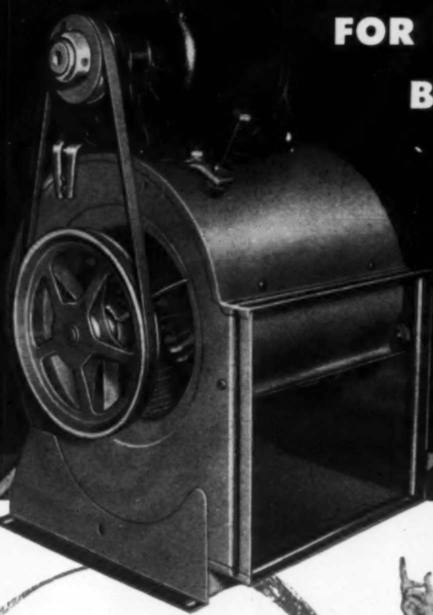
ELECTRIC MOTOR DIVISION
P. O. Box 170 • Dayton, Ohio
International Division: Milwaukee 1, Wisconsin

LEADERS RELY ON LAU

FOR SUPERIOR BELT-DRIVEN BLOWER ASSEMBLIES



Lau Series "A" Blower Assembly

MILLIONS ARE IN SERVICE

Advanced design and quality engineering throughout distinguish this **Lau** Belt-Driven Blower Assembly—leader in its field. It is far easier to install, lower in final installed cost, superior in performance, and possesses longer trouble-free operating life. Check these major features against your requirements:

One-piece completely adjustable motor mounting that permits **any** motor location desired. Three-point suspension bearing bracket used for all angles of discharge. Housing base is rigid heavy 16-gauge steel. Entire unit is die-formed. Two-stage centerless ground and burnished shafting with custom-built belt. Perfected **Lausteel** variable speed pulley allows speed variations up to 30%. Center suspended wheel; positive alignment of wheel to venturi. **Lau** self-aligning porous bronze sleeve bearings; bearing assembly with long-life lubrication. Embossing of scroll sides reinforces venturi inlet and discharge. Capacity range 350 to 22,000 cfm.

Put your Problems up to Lau

Our engineering experience is at your disposal. Write for **Lau** Blower Catalog 707.

LB-1-55

THE LAU BLOWER COMPANY • 2112 Home Avenue, Dayton 7, Ohio

In Canada • The Lau Blower Company of Canada, Ltd., Kitchener, Ont., Canada

LAU World's Largest Manufacturer of Air Conditioning Blowers

YOU'LL SELL MORE PROFITABLE JOBS

with the complete line of

Curtis

AIR CONDITIONING AND REFRIGERATION EQUIPMENT

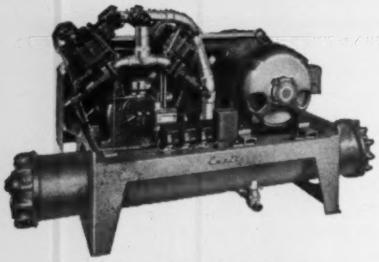
Every product in the Curtis line is built with quality material and workmanship.

Curtis equipment is known around the world for its dependability and efficiency.

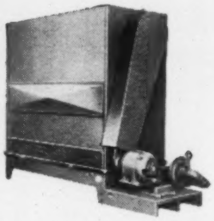
With the complete Curtis line, you can handle any installation for **Home, Office, Store,** or **Factory.**

Room Air Conditioner—an attractive, efficient unit with a BIG market potential

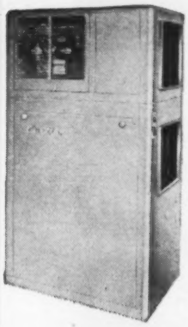
Packaged Units—
2, 3, 5, 7½ and 10 tons
Choice of open or semi-hermetic compressors . . . and 15 ton packaged Central type units



Condensing units—through 80 tons



Evaporative Condensers, Cooling Towers and Air Handling units to match



Residential cooling and heating units

You may qualify for a direct factory franchise. For immediate information on how to take advantage of this profit-making opportunity, write us, using your company letterhead.

POST
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National advertising in *Saturday Evening Post, Time, Newsweek* and *House and Home,* plus many other publications helps sell Curtis to your customers and prospects. Attractive new sales literature is available to help you sell in your local area.

830-R

CURTIS REFRIGERATING MACHINE DIVISION
OF CURTIS MANUFACTURING CO.

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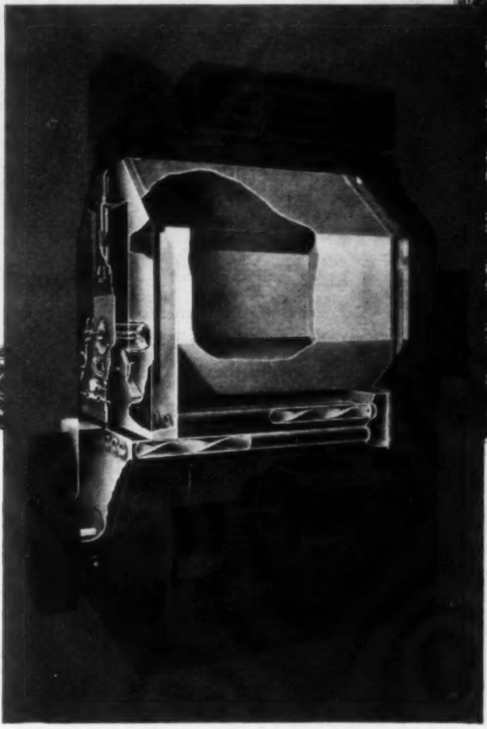
NOW...ANOTHER DRAVO FIRST IN INDUSTRIAL SPACE HEATING

DRAVO COUNTERFLO HEATERS NOW CARRY

A FULLY BONDED 10-YEAR GUARANTEE

ON ALL PARTS WHICH ARE IN DIRECT CONTACT WITH FLAME OR FLUE GASES!



IN THOUSANDS OF INSTALLATIONS, users continuously report the exceptional stamina and long life of Dravo's stainless steel combustion chamber and heat exchange system. This outstanding record enables us to now guarantee long service life of these vital parts for maximum economy in your heating equipment investment. This bonded guarantee is backed not only by Dravo, but also by one of America's foremost bonding and guaranty companies.

ANOTHER EXAMPLE OF DRAVO LEADERSHIP, this bonded guarantee is further evidence of the continuing research and development work that has enabled Dravo to pioneer many industrial space heating equipment improvements. Some of these Dravo-introduced developments are: the floating stainless steel combustion chamber, four-pass combustion system, electronic flame control, U. L. approved design, burners scientifically designed for heater and many other advances to improve heater efficiency and longevity.

IF ECONOMY AND LONGEVITY ARE IMPORTANT TO YOU, why not investigate the heater that consistently leads the field in quality, efficiency, long life and economical operation? You can get complete information on Dravo Heaters by simply checking the coupon at right for the Btu range that covers your requirements—mail it today.

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Please send me complete information about the Dravo:

☐ Counterflo Space Heater (400,000-2,000,000 Btu/hr. output)
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☐ Gas Fired Unit Heater (68,000-180,000 Btu/hr. output)
☐ Please have a representative call at no obligation to me.

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Gallaher Air-Vans *are on the* CHASE

AND they're there because the people who run the Chase Hotel in the center of St. Louis's fashionable West End want attractive as well as functional design—even in power roof exhausters. Harold Kopler, general manager of the Chase and Park Hotels specified Air-Vans to solve the problem of cooling the Chase's summer kitchen.

Says Mr. Kopler, "you cannot get better exhauster's for tall ceilings. It's quiet, handles a lot of air."

Installation was no problem. The hotel maintenance department took care of that itself. In one day they cut a hole in the roof and the Air-Van exhauster went up the next.

* * *

This is an example of why more and more engineers and architects specify Gallaher Air-Vans. Features such as patented built-in scroll design, motor out of the airstream, availability in special metals, weatherproof design and low silhouette are just a few of the features. Next time you want to move air, find out about Gallaher Air-Vans.

Direct Drive units 150-11,000 CFM. Belt Drive 3500-65,000 CFM, developing static pressures to 4".

The Chase Hotel across from Forrest Park in St. Louis.

The GALLAHER Company

Pioneers in Research-Designed Power Roof Exhausters.

4108 DODGE STREET
OMAHA, NEBRASKA

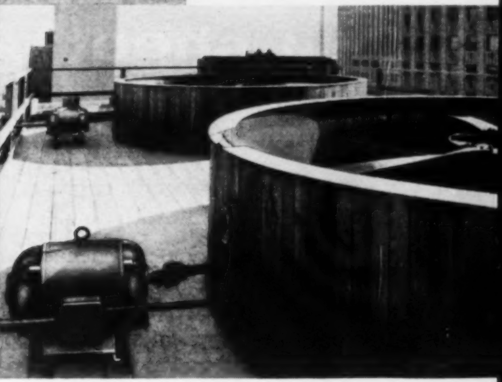
ROBBINS & MYERS AIR CONDITIONING MOTORS

For Cooling Towers
All R & M Air Conditioning Motors are completely "weatherized" for outdoor applications. Here is the one motor you can install and forget.

For Compressors
Patented R & M electronic speed-torque tester shows the *complete* acceleration curve of every R & M motor as it comes off the assembly line, enabling us to design out the dips that make a motor "hang up" and stall during starting.

For Blowers
R & M Air Conditioning Motors are balanced to a far greater degree than normal industry standards; won't transmit annoying vibration through metal ducts.

Robbins & Myers Has Done Something About the Weather!



When it comes to applications involving moisture—and lots of it—most motors just can't stand the gaff. And outdoor applications, like cooling towers, really put a motor to the test.

That's why you'll be interested to know about the unusual R & M "weatherized" Air Conditioning Motor. It's the one motor that's truly conditioned for air conditioning service—*at no extra cost to you.* Install it anywhere—even outdoors without a cover—and you'll see what this remarkable weatherizing process can mean in dependable, economical operation.

And there are other features—usually extra-cost optionals in most motors—that R & M brings you at standard motor prices. Extra-large prelubricated ball bearings . . . full-height end-heads with debris-proof screened openings . . . end-to-end clean-sweep ventilation.

These are just some of the things that give you the extra margin of dependability that air conditioning applications demand. Inside and out, R & M motors are engineered for every air conditioning job.

To get all the facts about the finest air conditioning motor your money can buy, write for a free copy of our Air Conditioning Motor Bulletin HP.

1 to 125 HP . . . Weatherized Inside and Out

Steel parts undercoated.

Rotor assembly rust-inhibited.

Cast-iron parts given special anti-corrosion treatment.

Terminal box gasketed, leads sealed at shell.

All standard R & M 220/440-volt motors easily reconnected on the job for 220-volt part winding starting.

R&M ®

ROBBINS & MYERS, INC.

MOTOR DIVISION: SPRINGFIELD, OHIO • BRANTFORD, ONTARIO

Fractional & Integral h.p. Motors & Generators
Moyno Pumps
Propellair Industrial Ventilating Equipment
Electric Fans
Electric & Hand Hoists & Cranes

There's built-in
durability in

WEIRKOTE

for all sheet-metal work

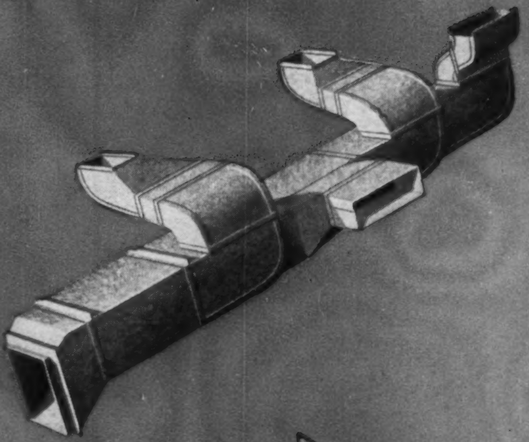
Wherever a durable zinc-coated material is needed for sheet metal fabrication, there's nothing better than Weirkote. Gutters, downspouts, ducts—no matter what the application, the name Weirkote on galvanized steel means uniformly high quality steel, tightly coated with zinc to resist cracking, peeling, flaking and corrosion. The high quality is assured by Weirton's modern mills and methods—and men.

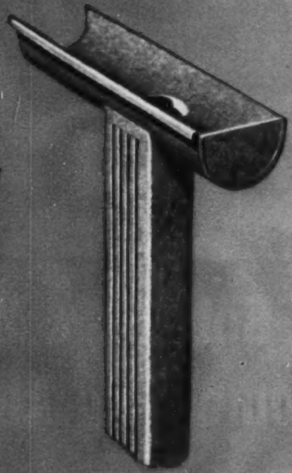
When your specifications call for galvanized steel, call Weirton, and be sure.

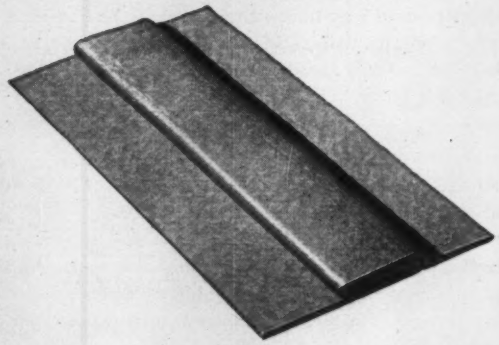
Weirkote is available in coils and cut lengths: gauges 16 to 30 inclusive. Maximum width—42", maximum cut length—168". Weirkote can be obtained to fit any customer requirement. For standard roofing and siding it is guaranteed to conform to A.S.T.M. specification A361-52T.

WEIRTON STEEL COMPANY
Weirton, West Virginia

NATIONAL STEEL CORPORATION



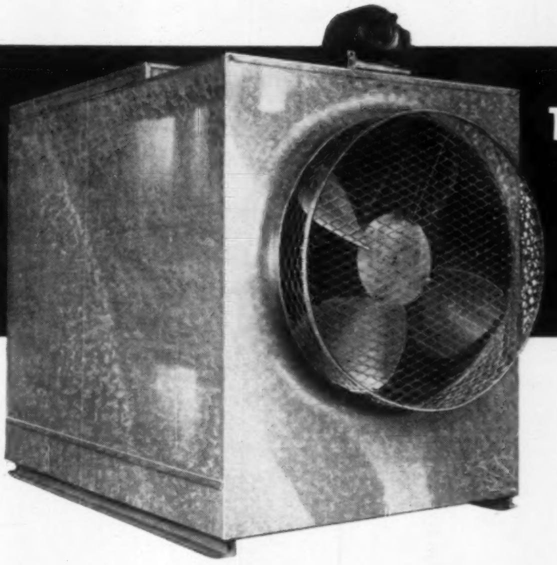




PITTSBURGH LOCK

WEIRTON STEEL COMPANY

Dover Stops Rust Cold!



THE COOLING TOWER THAT'S HOT-DIP GALVANIZED AFTER FABRICATION

You put an end to troublesome, costly rust problems when you specify Dover packaged steel cooling towers. Dover, and only Dover, offers you at no extra cost a complete packaged cooling tower that is hot-dip galvanized *after* fabrication. And, another extra: the fan and fan shaft are non-corrosive to prevent rusting and unsightly corrosion ordinarily present after several months of service. These features are standard on all Dover Series "CF" towers.

On Your Next Job, Choose Dover Cooling Towers and Get ALL these Bonus Features

LOWER OPERATING AND MAINTENANCE COSTS . . . with a Dover Tower you get low-cost water cooling for any application requiring from 2 to 100 tons capacity. And the neat, modern design is an integral part of the rugged construction, promising good appearance with low maintenance costs.

NO NOISE PROBLEM . . . there's no noise problem with Dover propeller-type towers. Propeller fans are properly arranged and designed to eliminate noise and to allow for reasonable duct loss for inside installations.

GUARANTEED CAPACITY . . . in a modern fully equipped testing lab at the Dover plant, all tower models have been pre-tested under actual operating conditions. These actual tests make it possible for Dover to *guarantee* delivery of rated thermal capacity.

A stock of Dover packaged steel cooling towers is maintained in four parts of the country, providing fast delivery to all locations. There is a Dover representative near you . . . contact him today or simply fill out the coupon below.

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DOVER MANUFACTURING COMPANY
Department 100, 3117 Weatherford Avenue
Independence, Missouri

☐ Please send me full information about Dover steel cooling towers.

☐ Please have a Dover representative call on me.

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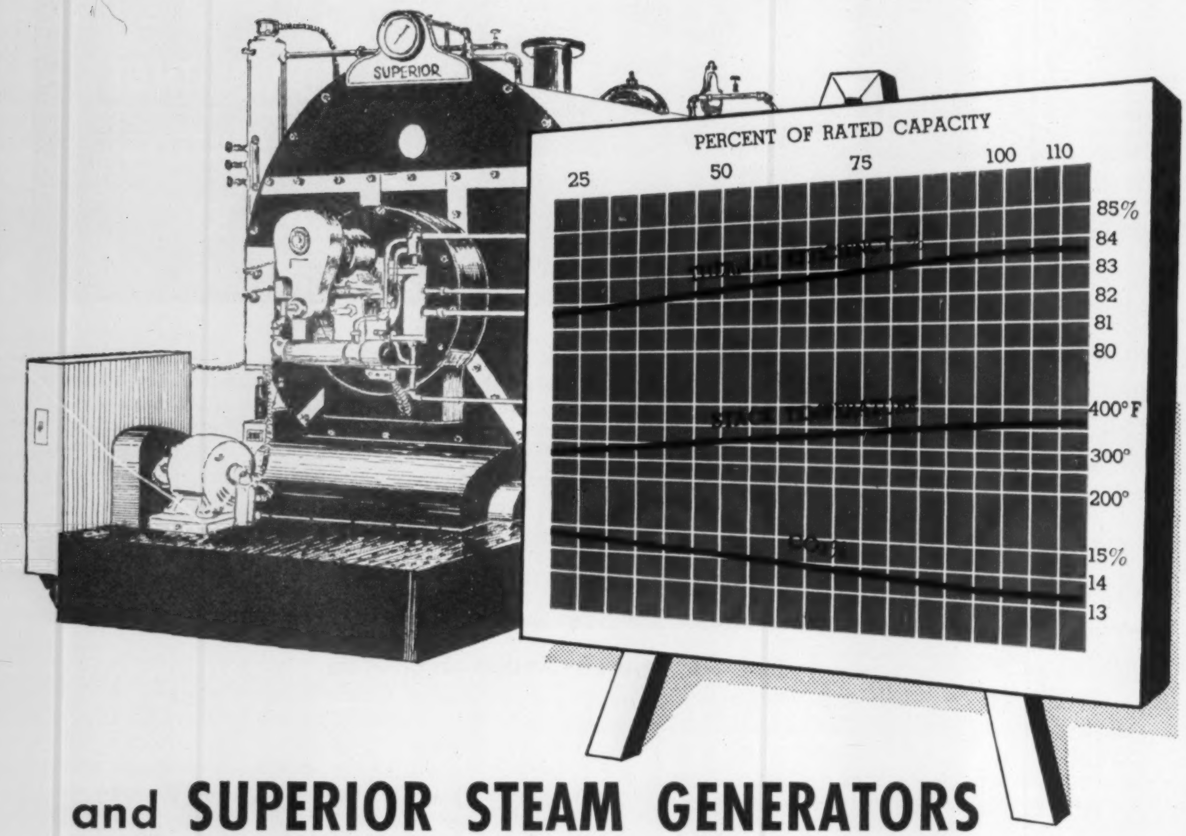

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Superior Steam Generators are fully automatic, burning oil or gas or both. 18 sizes from 20 to 600 b.h.p. for pressures to 250 p.s.i. or for hot water. Write for catalog 704.

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STEAM GENERATORS

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

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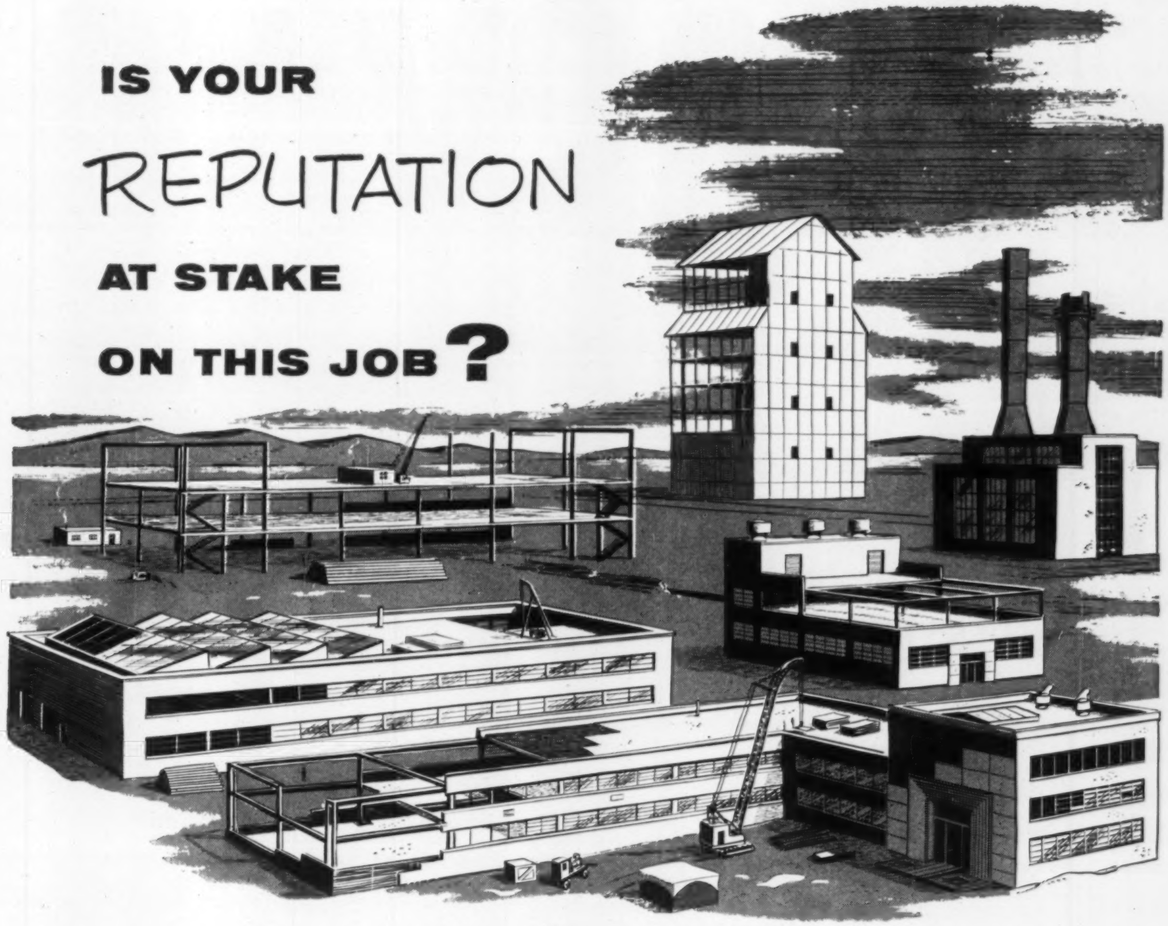

Make-shift or hit and miss piping systems are not only costly in corrections and repairs . . . but certainly reflect on the ability of the mechanical engineer. It is *not* necessary to gamble on an efficient, long lasting insulated piping system. **RIC-WIL**'s forty-five years in the Insulated Piping Field is your assurance of the finest piping system for both overhead and underground use. Specify **RIC-WIL** and be sure of the results. For complete technical information contact your nearest **RIC-WIL** field representative or send for the **RIC-WIL** catalog.

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Quality Piping Systems . . .
. . . of Exceptionally High Thermal Efficiency

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PREFABRICATED INSULATED PIPING SYSTEMS

BARBERTON, OHIO

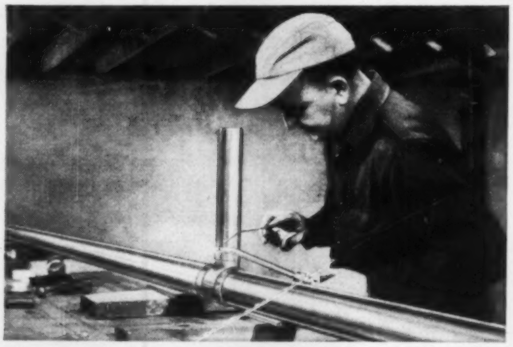
EASY TO INSTALL!

Chase Copper Tube for Soil, Waste and Vent Lines Requires Fewer Joints

Chase Copper Drainage Tube comes in 20 foot lengths. That means fewer joints for soil, waste and vent lines. You'll save time not only in installation but in final pressure-testing, too.

Because it's light but rugged, Chase Copper Tube joined with Chase Solder-Joint Fittings allows you to do a considerable amount of economical pre-assembly.

You can stand by every drainage job you do with Chase Copper Tube because it can't clog with rust and stays pressure-tight. Place your next order for drainage tube at your Chase wholesaler.



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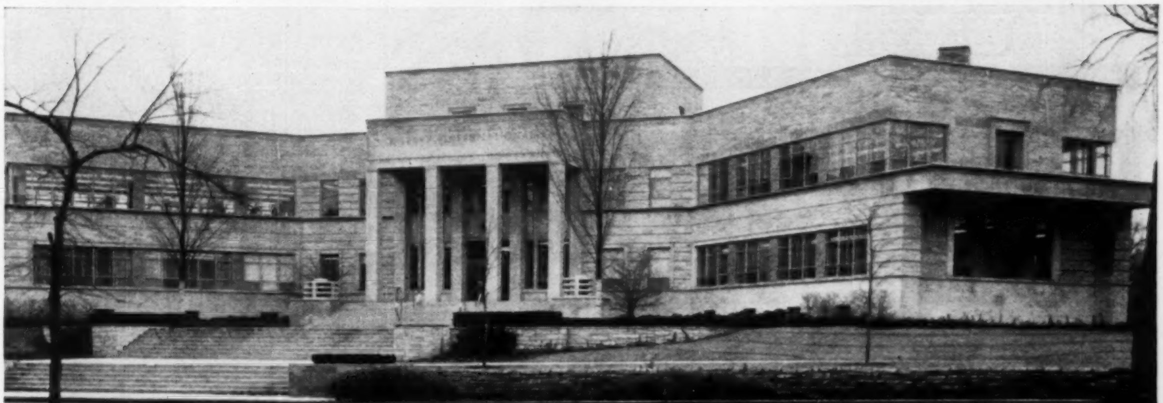
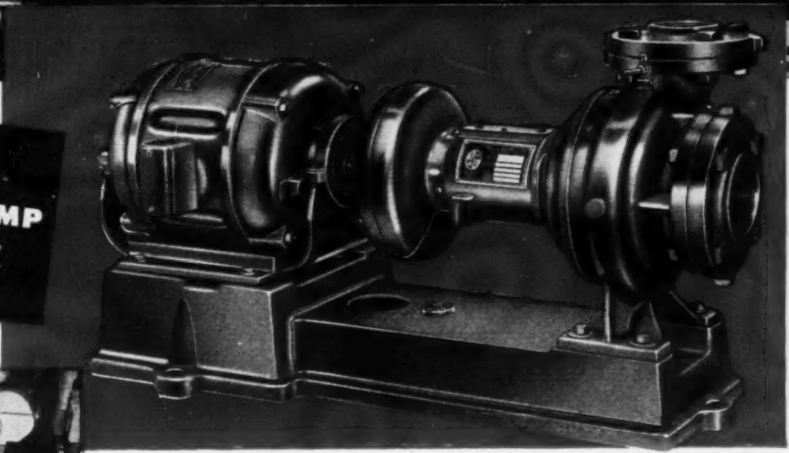
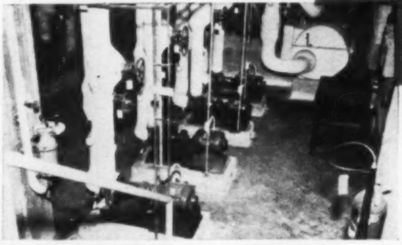




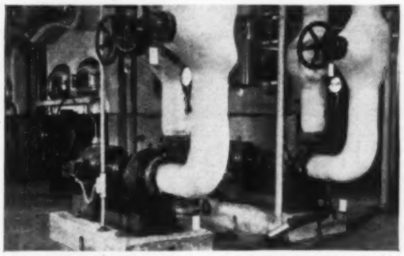
B & G

UNIVERSAL PUMP

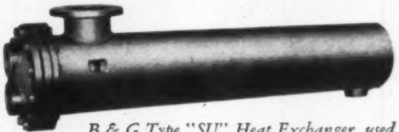
designed specifically to operate *QUIETLY* in hot water heating systems



Installation of B & G Universal Pumps for circulating heating and cooling circuits.



Circulation from chiller to cooling tower is handled by B & G Universal Pumps.



B & G Type "SU" Heat Exchanger, used for heating system water with steam.

NEW INTERNATIONAL ROTARY BUILDING SELECTS *B & G UNIVERSAL PUMPS AND HEAT EXCHANGERS* FOR HEATING AND COOLING SYSTEM

The advantages of mechanically circulated water for both heating and cooling are well illustrated in this installation.

To assure *quiet* operation, B & G Universal Pumps are used to circulate all water, including that in the chiller and cooling tower circuits. The same piping system is used to circulate hot water in winter and chilled water in summer. Convectors with adjustable-speed fans act as room distributing units.

For ventilation, fresh filtered air from a main ventilating fan is introduced to the convectors through small flexible tubes. This air passes over the convector coils and is either heated or cooled.

Water for the heating system is heated with steam in a B & G Type "SU" Heat Exchanger. Steam is also used to heat the service water by means of a storage tank with a steam coil installed.

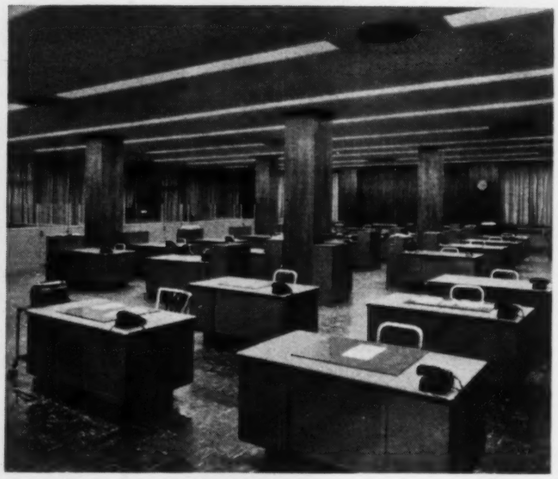
For full information on B & G Hydro-Flo Products, send for Catalog GK-954

BELL & GOSSETT COMPANY

Dept. DU-5, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto

Which is the best way
to air condition
an OFFICE?



Carrier Zoning Weathermakers* heat and cool the new Patriot-News Building in Harrisburg, Pa. The Zoning Weathermakers blend heated and chilled air, provide individual control in as many as fourteen different zones.

Carrier Weathermaster* Units heat and cool the 4-story Farm Bureau Insurance Building. Each under-the-window unit is individually controlled, is fed hot water for heating or conditioned air for cooling, both from a central source.

Carrier Self-contained Weathermakers serve the offices of American Bosch Arma Corporation, Springfield, Mass. They are installed with little interference to business—and are now available in air-cooled models that need no water.

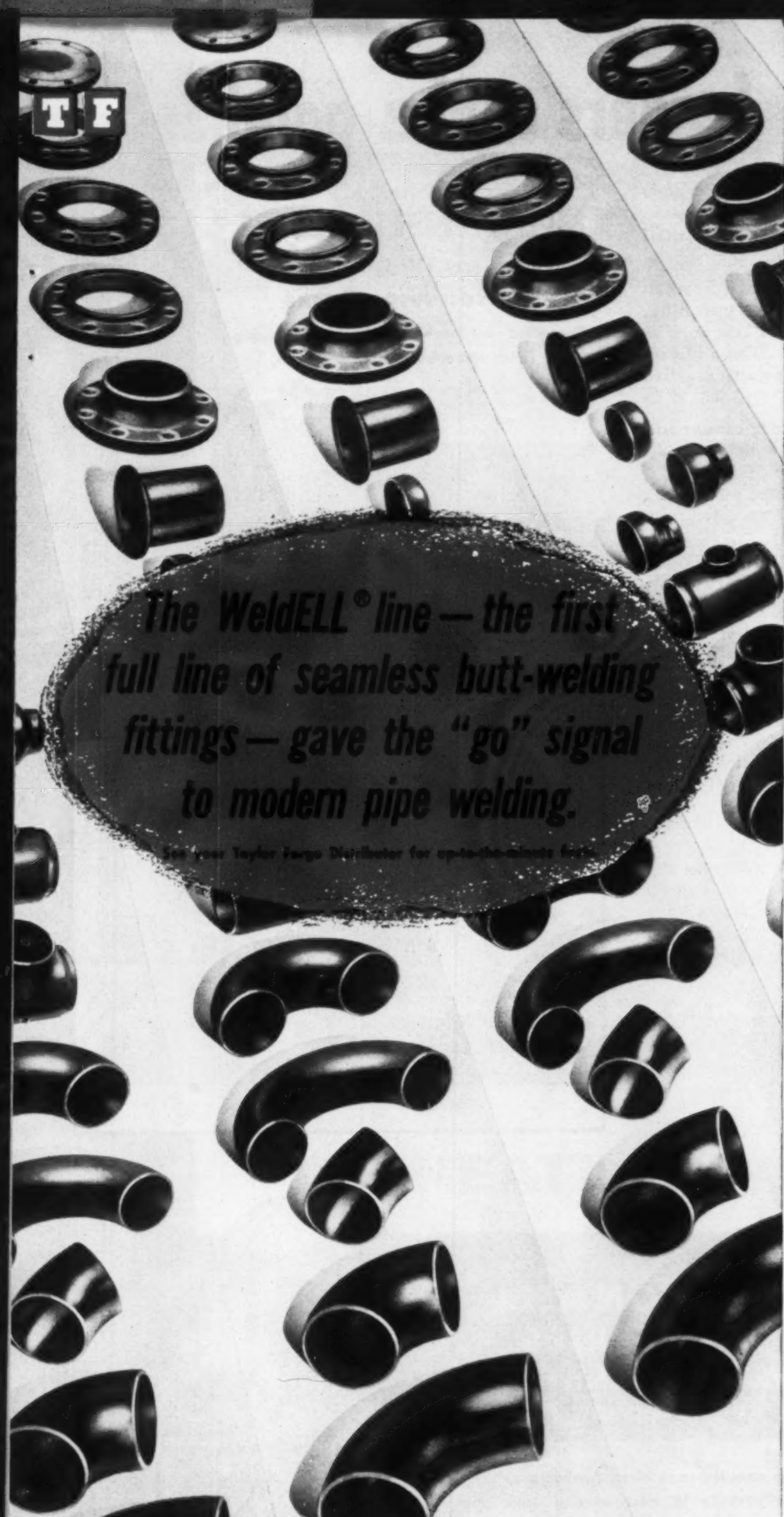
Carrier is the quickest way to the right answer

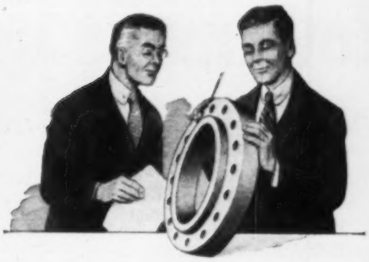
JUST 1–2 AND THE JOB IS THROUGH!

Carrier has all the ways to air condition any job—and all Carrier equipment is engineered to the same uniform standard. So short-cut hours of selection by (1) using the Carrier line as your shopping guide and then (2) comparing values. Get in touch with your Carrier dealer or distributor. He's listed in the Classified Telephone Directory. Or write to us directly. Carrier Corporation, Syracuse, New York.

* Reg. U.S. Pat. Off.

Carrier air conditioning · refrigeration · industrial heating


T F
The WeldELL® line — the first full line of seamless butt-welding fittings — gave the "go" signal to modern pipe welding.
See your Taylor Forge Distributor for up-to-the-minute facts.



We had to quit guessing in the twenties

The founder of Taylor Forge used to say that "uniformity of strength should be the final goal of every engineer"... and no doubt this kind of thinking motivated the Taylor Forge organization to take so much initiative in the development of forged steel components for pressure piping.

The pattern was set in the twenties. Before 1920 little had been done in the way of pipe fitting and flange standardization. As early as 1905, however, Taylor Forge had produced forged steel flanges for Taylor pipe, and they had proved so superior to cast iron flanges that within a few years more flanges were being made for others than for our own use. But these forged flanges were bolted to the iron flanges of valves, pumps, and the like; so they simply followed cast iron standards.

In view of the obviously far greater strength of forged flanges, this was foolishly safe, and patently not at all in the "Uniformity of Strength" tradition. Moreover, in the twenties pressures were starting their upward climb. The 125 lb. and 150 lb. standard wouldn't do. Now it was 400; then 600; then 900 pounds. As the pioneer and leader in this field, Mr. Taylor saw the need for formulating standards and went to work on it.

Although one of the first studies conducted in this field, his work ranks to this day as one of the most thorough jobs ever done. In this work Mr. Taylor was in touch with Mr. Sabin Crocker, who is author of today's "Piping Handbook." He also collaborated with Professor E. O. Waters of Yale. Mr. Taylor ran exhaustive full scale tests on actual flanges to provide the test data which was then analyzed and formulated by Mr. Taylor and Professor Waters. The result was the Taylor-Waters Formula, presented before the ASME in 1927.

Still found in every engineering handbook, the Taylor-Waters formula was, and is, the basic means of determining flange stress under a given condition of loading. In the years since, Taylor Forge has also played a leading part in bringing standards into correlation with broadening needs . . . but this is *another* story.

An episode in the story of
Taylor Forge leadership in designed piping

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS • General Offices and Works: P.O. Box 485, Chicago 90, Illinois

Offices in all principal cities • **Plants at: Carnegie, Pa.; Fontana, Calif.; Gary, Ind.; Hamilton, Ontario, Canada**

How make-up feeders make good!

Check up on your make-up valve—the valve that adds water when needed to your condensate receiving tank. If it's not doing a job—and a lot of them are not—install one that measures up to these requirements.

1. Tight closing—Make-up feeders should feed only when called upon. If they fail to seat tightly after operating, the receiver may flood. This means a loss of heat units as hot condensate is spilled down the drain. The addition of extra raw water also opens the door to an excessive amount of liming and scaling.

2. Adequate capacity—If a make-up feeder cannot add water fast enough, then it must start sooner—that is, it must be set to operate at a higher level. On the other hand, if the feeder has the capacity it should have, then most of the receiver capacity can be left for condensate accumulation.

Measuring up to these requirements becomes more difficult as water supply pressures vary. Shown here are McDonnell Make-up Feeders designed specifically for this purpose. They fit different methods of installation, but have the same standard of performance. They offer drip tight closing and large feeding capacity far beyond the point where ordinary float valves fall short.

Follow the pattern established by many manufacturers of boilers and boiler feed systems. Use McDonnell Make-up Feeders to replace unsatisfactory float switches and float valves. Install either the No. 27 or 21 Series, whichever fits your system, and you can expect trouble-free service plus substantial operating economies.

• • • • • • •

In any boiler feed system, best practice is to start and stop boiler feed pump according to the water line itself . . . by a control like the McDonnell No. 150 or 157 (for boilers up to 150 lbs.) or the new 92 Series (for boilers up to 250 lbs.). These also include low water fuel cut-off and alarm switch.

Write for engineering data.

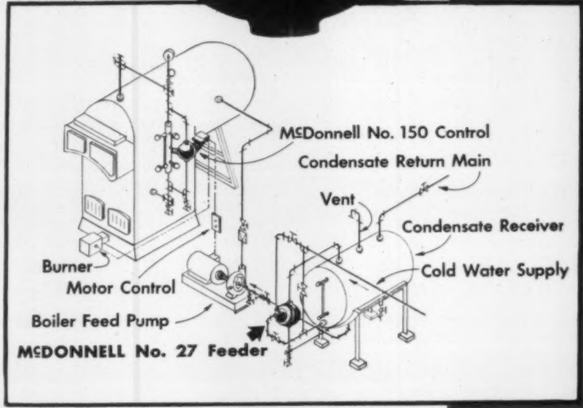
McDONNELL & MILLER, Inc.
3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One Thing Well

McDONNELL No. 27

Make-up Water Feeder for Receiving Tanks

Connected to receiver with 1" equalizing pipes. Feeds through separate feed line.



McDONNELL 21 SERIES

Make-up Water Feeders for Receiving Tanks

Flange mounted to receiver. Available with standard flange sizes to fit most existing tank openings.

McDONNELL

Boiler Water Level Controls

laboratory facilities

heat and flow controls

scale removal

hydrostatic testing

shipping

More than meets the eye . . .

WHEATLAND STEEL PIPE

-pipe with the yearmark!

The production of quality steel pipe is a science in itself. There are no quick tricks, for it is a long way from the mines to your pipe warehouse and each step must be carefully watched and supervised.

Behind the scenes at Wheatland to insure a flow of uniform pipe are the laboratories, the technicians who control heats and temperatures, the mill men and inspectors, who work on scale removal, cutting, threading and the shippers who move your orders in the fastest, most economical way. All of these men trained in their own field work to make Wheatland steel pipe as near perfect for you as possible. On your next order specify Wheatland—and get the most for your steel pipe dollar.

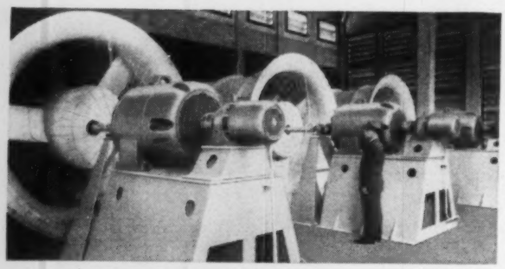
WHEATLAND TUBE COMPANY BANKERS SECURITIES BUILDING • PHILADELPHIA • PA. • MILL : WHEATLAND • PA.

MEMORIAL TUNNEL

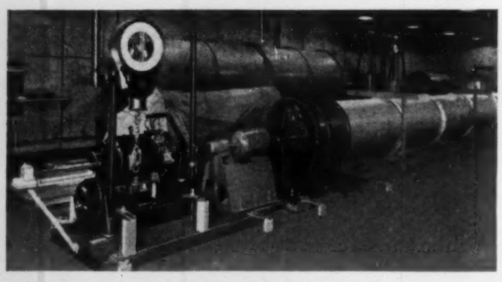
North entrance to West Virginia Turnpike's Memorial Tunnel. American Blower Fans exhaust fumes from three huge outlets above the entrance. General consultants: Howard, Needles, Tammen & Bergendoff, Charleston, W. Va. Tunnel consultants: Singstad & Baillie, New York, N.Y. Contractor: Kuhn Construction Co., Charleston, W. Va.

Giant fans blow fresh air through a mountain

Powerful American Blower Fans keep air fresh, and free of exhaust fumes, in West Virginia Turnpike's $5,000,000 half-mile Memorial Tunnel



American Blower Fans at south entrance to the Turnpike's Tunnel force air one-half mile through mountain.



Scale model was built and tested in American Blower laboratory prior to construction of Tunnel's huge fans.

West Virginia's 88-mile $133 million Turnpike – from Charleston, W. Va., to Princeton, W. Va. – is the first completed segment of a superhighway network linking the Great Lakes with Florida.

Most spectacular feat of its construction is the Memorial Tunnel burrowing through the heart of a West Virginia mountain. Open-ended, and over a half-mile in length, the tunnel posed a mountain-sized ventilation problem – which was solved using powerful American Blower air-handling equipment.

Three American Blower Vaneaxial Fans at the south entrance draw in outdoor air at up to 570,000 cubic feet per minute; three similar American Blower Fans at the north entrance exhaust the gas-laden air caused by the heavy vehicular traffic. Although the tunnel will handle approximately 10,000 vehicles daily, air inside remains fresh and free of exhaust fumes!

If *you* have an air-handling or air-conditioning problem, get in touch with your nearest American Blower Branch Office. American Blower engineers are familiar with the special problems of many industries. The same services are available in Canada through Canadian Sirocco Co., Ltd.

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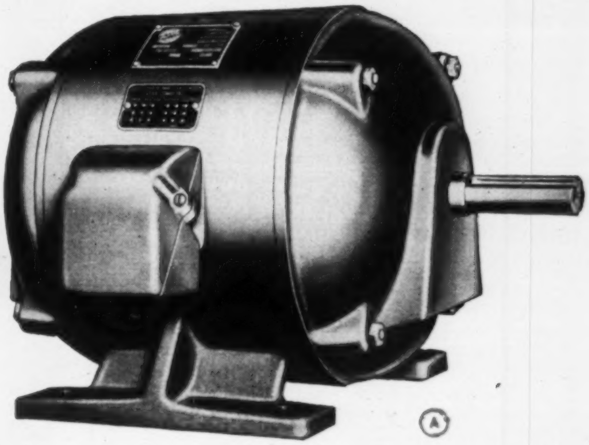
LIMA



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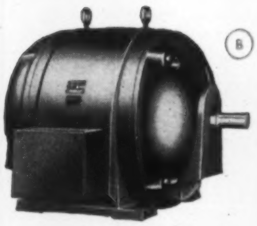

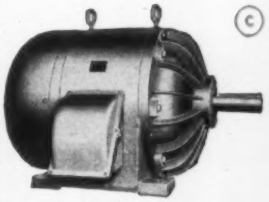

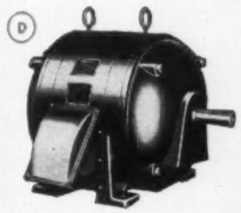

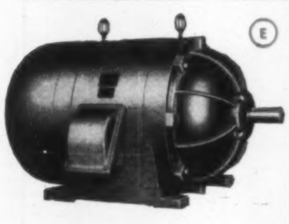

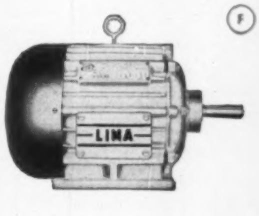

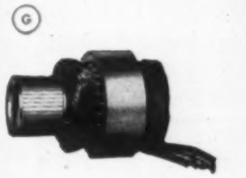

A Lima Type AC, semi-enclosed, dripproof. Lima Type TA, totally enclosed, non-ventilated. NEMA frame sizes 66 to 254.

B Lima Type BC, semi-enclosed, dripproof, NEMA frame sizes [illegible] to [illegible].

C Lima Type BC, totally enclosed, fan-cooled, NEMA frame sizes [illegible] to [illegible].

D Lima Type DC, semi-enclosed, dripproof, NEMA frame sizes 284 to 445.

E Lima Type DC, totally enclosed, fan-cooled, NEMA frame sizes 284 to 445.

F Lima Type E, totally enclosed, fan-cooled, NEMA frame sizes 224 to 326.

Lima Type ED, totally enclosed, fan-cooled, dust tight, U. L. Approved Class 2, Groups F & G, NEMA frame sizes 224 to 326.

Lima Type EX, totally enclosed, fan-cooled, explosion-proof, U.L. Approved Class 1, Group D, NEMA frame sizes 224 to 326.

G Lima Shell-type motors and complete special motors, made-to-order.

1/3 to 150 Horsepower

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WEIL-McLAIN SERIES **HR**

Heavy Duty Boilers for Horizontal Rotary Oil Burners

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STEAM:
3670-12,270 sq. ft.

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THE LINE OF "EXTRA VALUE" HEAT

SERIES HR BOILERS FEATURING...

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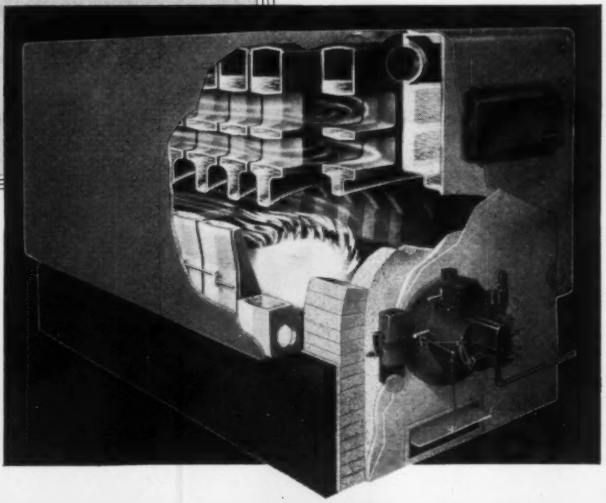
2. High base for more combustion space and elimination of high brick foundation.
3. Special steel front plate for simplifying installation of rotary burners. Openings in plate can be cut at factory for specific makes of burners.
4. Green enamelled steel jacket lined with thick blanket of fibre glass—saves insulating time.
5. Balanced gas travel through flueways for equal distribution of heat to all secondary heating surfaces.
6. Large waterways for rapid, efficient water circulation.
7. Individual short draw rods for easy, strain-free assembly. Sectional construction for easier installation.



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Weil-McLain Series HR Heavy Duty Boilers effectively develop the economies obtainable with horizontal rotary cup oil burners. Their specialized design fulfills the two basic requirements of high operating efficiency—*ample combustion volume and a high percentage of primary heating surface!*

Send for catalog No. C-188—see the design, construction and operating features which make the Series HR Boiler a genuine advance in oil burning efficiency.

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BOILERS · RADIATORS

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MICHIGAN CITY, INDIANA

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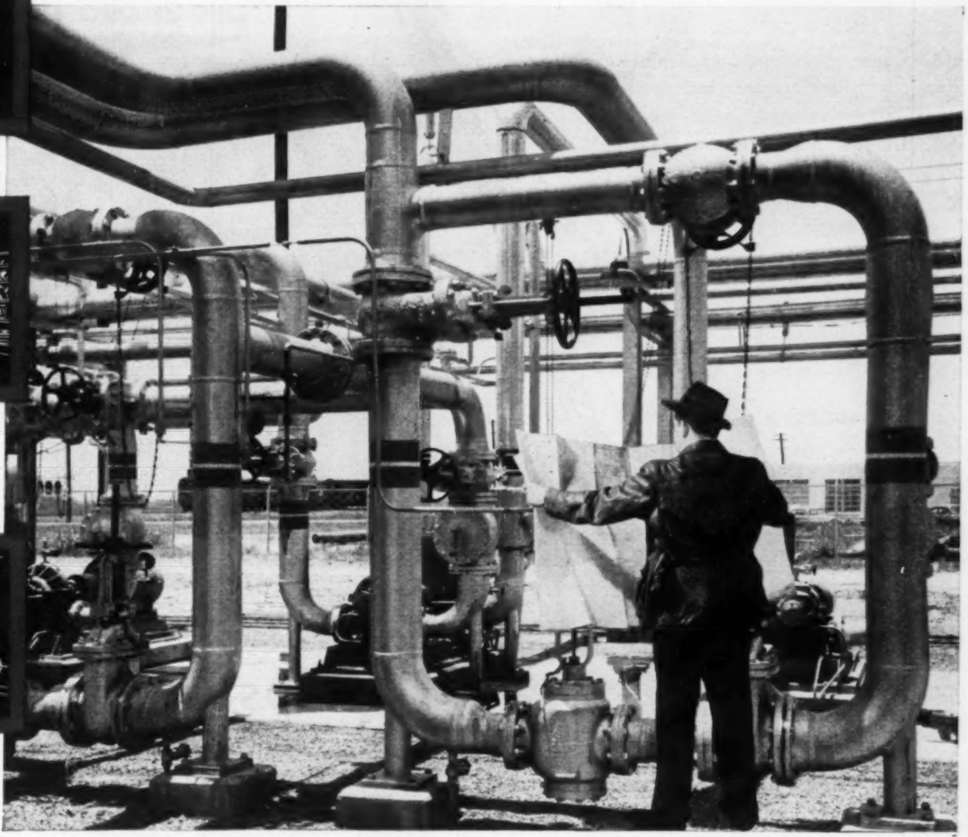
WHY IT PAYS
TO DO BUSINESS
WITH THE
LEADER



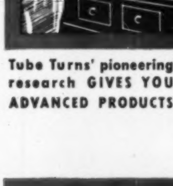
Tube Turns' nearby complete stock SAVES YOUR PURCHASING TIME

Tube Turns' pioneering research GIVES YOU ADVANCED PRODUCTS

Tube Turns' engineering help GIVES YOU COST-CUTTING IDEAS

How complete-line service gives you *more for your money!*

YOU SAVE PURCHASING TIME and are *sure* of getting the *right* fitting and flange for every job when you specify "TUBE-TURN"* and buy this leading line from your Tube Turns' Distributor. One source . . . one order takes care of all your needs with a selection of over 4,000 top-quality items. You cut red tape and avoid shopping around. Call your Tube Turns' Distributor for all your needs in welding fittings and flanges.



*"tt" and "Tube-Turn" Reg. U. S. Pat. Off.

TUBE-TURN Welding Fittings and Flanges are made in U. S. A.
They meet all U. S. piping code specifications

TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Detroit • Chicago • Denver • Los Angeles
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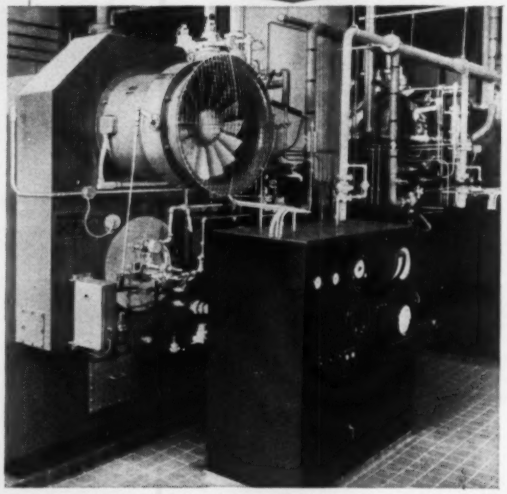
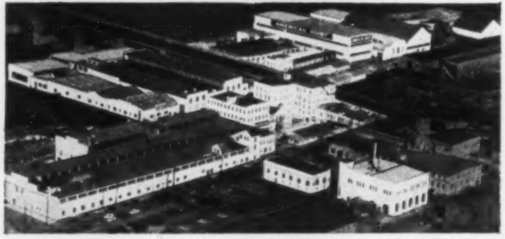
keeping steam cheap . . .

Low Cost Steam
produced here



Dual-unit installation of B&W Type FM Boilers at American Hoist and Derrick Company plant, supplying steam for processing and heating.

Helps American Hoist
cut costs here



Aerial view of large plant and facilities of American Hoist at St. Paul, Minnesota.

To reduce substantially its overall steam generation costs and overcome the problem of meeting wide and erratic load swings due to the use of steam hammers in the forge shop, American Hoist and Derrick Company of St. Paul, Minnesota replaced two old boilers with two B&W Type FM Boilers.

Now in service for over a year, the compact FM Boilers are providing steam for both processing and heating . . . are readily meeting all the service conditions under the direction of their automatic controls. Each unit has a steam capacity of 25,000 lb per hr at 200 psi, is equipped with a superheater to provide steam at proper temperature for various plant operations, and is designed to burn either gas or oil.

The FM Boiler is ideal for small to medium-sized operations, and has been widely applied to many larger installations as well, where multiple FM units have been found to be practical and more economical than one or more larger boilers requiring complete field erection and close operating supervision. The FM is self-contained and easy to install. For example, many have been set in place with equipment similar to that made by American Hoist. It is delivered complete with firing equipment and controls. This versatile steam generator is enjoying wide popularity with users in a large variety of industrial, commercial, institutional, and other classifications. The number of units now in service or on order have a total steam capacity of more than 9,000,000 lb per hr. It is available in standard sizes for loads ranging between 2900 and 36,000 lb of steam per hr at pressures to 235 psi. Special units for higher pressures are also obtainable.

The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

CONSIDER THESE COST-SAVING FEATURES

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
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- Suitable for Outdoor Service
- Burns Oil and/or Gas
- Saves Fuel
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- Safe, Automatic Operation

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THE EDITORS' PAGES

- *BUSINESS and professional men tire themselves out by pushing themselves to the limit of their concentration span, observes Dr. Walter Woodward, industrial psychiatrist with the American Cyanamid Co. An executive can concentrate on what he is doing for about two hours before his attention wanders. It takes a while for his mental energy to recover, and meanwhile he is frustrated because he can't get on with his work.*

Dr. Woodward prescribes that you limit your concentration to about 50 minutes, with a 10 minute break following. It is possible to repeat this 50 and 10 schedule four times without getting tired. This routine, according to the doctor, actually doubles the normal concentration span without imposing the penalty of great fatigue and inability to work. It isn't necessary to change your task; just change your pace.

Expanding Outlook Seen At Philadelphia Show

. . . more exhibits, attendance

PREPARATIONS for the continued growth of an industry that has never known a major setback marked the 12th International Heating, Ventilating and Air Conditioning Exposition in Philadelphia. Manufacturers of heating, ventilating and air conditioning equipment backed their plans for better business by presenting larger and more spectacular displays than ever before.

The number of exhibits increased to the record total of 472. Registered attendance for the week was 21,162, while visitors clocked at the door were 34,758. The difference represents the repeat visits.

The industry's expanding outlook was indicated both by the increased number of exhibitors and by the number engaging larger spaces than at previous expositions. "This is the first time we have ever displayed our complete line of heating equipment," one big exhibitor said.

The displays were completely previewed in the Show Section of the January HPAC.

Announce Development of Electronic Refrigeration

. . . uses Peltier effect

AMONG several electronic devices of tomorrow described at the recent winter meeting of the American Institute of Electrical Engineers was an electronic cooling device in which 6 oz of ice had been frozen.

According to David Sarnoff, chairman of the board of the Radio Corp. of America, it is believed to be the first time a freezing temperature has been attained in a sizable area without mechanical refrigeration.

The cooling system uses the Peltier effect. An electric current through a joint made of two different metals causes heating or cooling in the joint. The direction of flow of the current determines whether heat or cold marks the effect.

The RCA application of this discovery was developed by Engineer Nils E. Lindenblad.

Construction Awards Top All-time January Peak

. . . lower than December

CONTRACT AWARDS for future construction in the 37 states east of the Rockies emphatically set a new all-time high for all Januarys, according to the F. W. Dodge Corp.

The total of $1,504,450,000 was 31 percent ahead of the figure for January 1954, which set the all-time January high mark up to this year.

Thomas S. Holden, vice chairman of Dodge, said: "While it is true that the sharpest increase was in awards for residential construction, there was also a substantial increase in nonresidential building, which was up 19 percent. This rise was accounted for by increases in commercial buildings, hospitals, churches, public buildings and social and recreational structures. Contracts for manufacturing buildings showed a drop below last year, while school buildings remained at about last year's level."

Individual January classifications were: nonresidential, $564,788,000, down 19 percent from December but up 19 percent over January 1954; residential, $690,355,000, down 9 percent from December but up 49 percent over January 1954; heavy engineering, $249,307,000, down 32 percent from December but up 15 percent from January 1954.

E. P. Heckels Observe 50th Anniversary

. . . air conditioning pioneer

E. P. HECKEL, consulting engineer and member of HPAC's board of consulting and contributing editors, and Mrs. Heckel celebrated their 50th wedding anniversary earlier this year. Mr. Heckel is a pioneer in air conditioning and was one of the founders of the Carrier Corp. He has contributed toward the advancement of the profession as a consulting engineer, and at the present he is chairman of a committee to revise the ventilation section of the Chicago Building Code.

Mr. Heckel has authored several articles that have appeared in HPAC. The first one was published in 1936, and the most recent appeared in May 1954 on the subject of high speed, high altitude aircraft presenting a challenge to air conditioning engineers.

Brochure Presents History of Large Contractor

. . . firm 54 years old

THE NAROWETZ Heating and Ventilating Co., heating and air conditioning contractors of Chicago, has issued a historical brochure citing the founding of the company by Louis S. Narowetz in 1901. The growth and development of the organization is portrayed along with the types of installations in which it has had a part during the 54 years. The first brochure that the company has published, it not only marks the golden anniversary in 1951 but gives a comprehensive view of the contracting operations over the years.

Many commercial buildings are pictured in which the heating, ventilating and air conditioning systems have been installed, as well as industrial plants, schools, hospitals and other public buildings.

Louis L. Narowetz, president and son of the founder, looks toward the future with great confidence for the heating and air conditioning industry.

Gas Sales Reach Highs for December and 1954

. . . manufactured gas down

TOTAL sales of the gas utility and pipe line industry in December 1954 amounted to 6475 million therms, an increase of 14.2 percent over sales of 5670 million therms in December 1953, according to the American Gas Association. This represents the greatest percentage increase in gas sales since May 1953 and marks a new high for the month of December.

Natural gas sales in December amounted to 6126 million therms, an increase of 14.1 percent over the 5368 million therms sold in December 1953. Manufactured and mixed sales increased 15.6 percent, from 302 million to 349 million therms. Sales of straight manufactured gas were down 13.5 percent in the month, to 51 million therms.

Total sales of gas also reached a new high for 1954, when 61,134 million therms were distributed. This was equal to an increase of 8.4 percent over the 56,382 million therms sold in 1953.

Natural gas sales in 1954 increased 8.7 percent over the previous year, to 57,839 million therms. Sales of manufactured and mixed gas increased 3.3 percent, to 3295 million therms in 1954. Sales of straight manufactured gas were down 32.9 percent, to 561 million therms.

New Approach To Differential Calculus

. . . developed by John Aeberly

MANY GRADUATE engineers — and good ones, too — doing air conditioning, ventilating and heating work are quick to admit that much they learned about calculus has been forgotten since their school days.

This isn't true, however, where John Aeberly is concerned. As Chief of the city of Chicago's Bureau of Heating, Ventilating and Industrial Sanitation, and as an active member for many years of the American Society of Heating and Air-Conditioning Engineers, Mr. Aeberly has made many important contributions to the field in which he works. He has also written and published a monograph in which he develops a new approach to the fundamentals of differential calculus that has attracted the interest of many outstanding mathematicians.

Briefly, this approach consists of the use of fractional increments of the variables rather than the customary delta increments. By means of this approach, the usual derivatives for algebraic, logarithmic, exponential and trigonometric functions can be found.

Mr. Aeberly's method has been used with success in evening courses at Rockford (Ill.) College. E. C. Varnum, of the Barber-Colman Co., who teaches such a course, tells us that student reaction to the new method has been favorable, and examination results have shown that the method leads to good facility in basic processes.

Army Accelerates Climate Research

. . . at new center

TWENTY MILES west of Boston, Mass., on the shores of Lake Cochituate in Natick, is the new Army Quartermaster research and development center, dedicated recently. The center has 10 reinforced concrete buildings.

It is unique since it is the first scientific installation designed to permit study of human physical reaction and evaluation of experimental military equipment under all known climatic conditions which may be artificially produced. An outstanding feature is the climatic research building which eventually will house climatic chambers to produce simulated weather conditions from −70 F to 168 F; from tropical cloudbursts to Arctic snowstorms, with winds up to 40 mph.

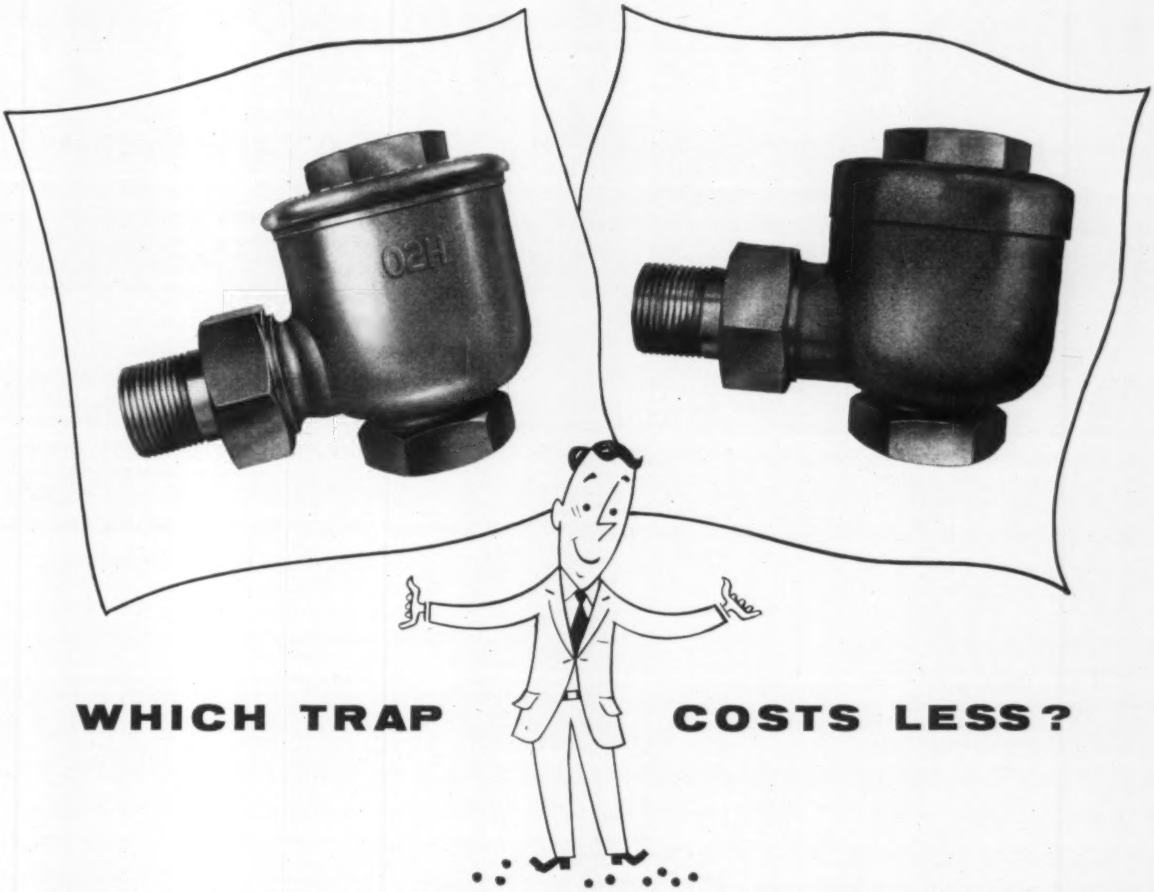
The boiler-pump house has three 300 hp water tube boilers, with space for one more. Circulation, condensation, and fire fighting pumps are in the basement. The water tower, for fire fighting ony, has a capacity of 75,000 gal. The fuel storage tank capacity is 48,000 gal.

One advantage of the center's 100 acre land area is that local space is ample for a variety of outdoor testing of items such as refrigeration and heating units.

The staff consists of approximately 1000 personnel, most of whom are highly trained scientific and technological specialists. Of this number, approximately 60 are military.

"Quote"

"Having worked in the bank for over 25 years without air conditioning, I can say, after just one summer, it's the best investment we ever made for comfort and convenience." — *Clarence Yonker, Vice President, Beverly State Savings Bank of Chicago, in a statement, January 20, 1955.*



WHICH TRAP COSTS LESS?

Other Webster Heating Equipment for commercial and industrial use includes Webster Tru-Perimeter Heating with steam or forced hot water; Webster Convectors; Webster Moderator Systems of Steam Heating and continuous flow controls for hot water heating – both with outdoor thermostat; and Unit Heaters. Data on request.

⁂

Webster Heating experience includes the field of vacuum, vapor and low pressure steam heating of buildings . . . medium pressure steam in industrial and process heating applications . . . and hot water heating systems for all types of building. Webster's specialized experience is available to you at the Home Office and through Representatives in 65 cities across the nation.

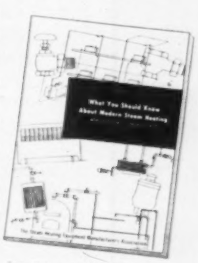
Add maintenance cost to initial cost; divide by the number of years of service, and you have a true basis for cost analysis. Do this with Webster Radiator traps and you'll find that costs are amazingly low. Here's why . . .

Webster Radiator Trap installations customarily give 15 to 30 years satisfactory service. A survey showed that 51,816 Webster traps in service averaged 30.3 years of service and were still going strong. Furthermore, in six installations, it cost less than one cent per year to maintain a Webster Trap. The average of 16 installations was only 2.8c per year.

No wonder a Webster Trap is a low cost trap. But in addition . . .

Webster traps save fuel, prevent steam loss, hold steam in the steam-using equipment until all useful heat has been radiated.

And, after years of service, when a Webster trap does show signs of wear, reconditioning is inexpensive and is readily accomplished. Webster Trap Attachments can be installed in original trap bodies – in almost all cases without "breaking" radiator connections.



"What You Should Know About Modern Steam Heating" is the title of this new booklet of interest to engineers. Write on your letterhead for your copy.

Address Dept. HP-3

WARREN WEBSTER & CO.
Camden 5, N.J. Representatives in Principal Cities
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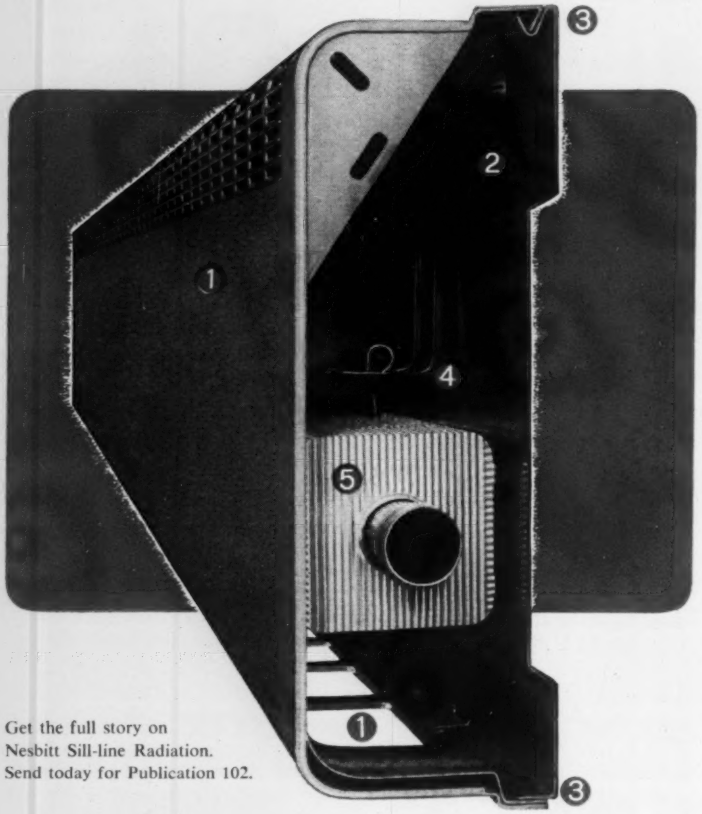
–since 1888
Webster
Systems of Steam Heating

. . . not first cost but cost per year of service

Newer than new...Sill-line for '55



Get the full story on
Nesbitt Sill-line Radiation.
Send today for Publication 102.

When Nesbitt Sill-line Radiation was brand new—a few years ago—it startled the industry by its functional ingenuity, imaginative artistry, and recordbreaking ease of installation . . . but as Nesbitts continuing engineering has found ways of further increasing these advantages to you, the contractor, these later improvements have been incorporated for 1955.

Today's Nesbitt Sill-line is the most advanced form of perimeter radiation—applicable with the greatest known ease and economy—evidence of a dynamic manufacturing policy.

FEATURING–

1. **Re-styled front panel** with attractive curved louvre grille and extruded bottom inlet looks well from any angle, any height. Above eye-level installations do not require inverted mounting or special enclosures.
2. **One piece back panel,** formed of 20-gage steel for maximum strength and rigidity, is prepunched for simplified installation without additional wall attachments.
3. **Top and bottom interlocks** of back panel support front panel for entire length of the ensemble. Permanent alignment assured.
4. **Adjustable hanger brackets** support heating element, provide for vertical adjustment for pitch and longitudinal movement for expansion and contraction.
5. **Corrugated aluminum fins** are damage resistant, easier to handle and install. Sized-to-mate tube ends permit quick end-to-end sweat jointing without couplings.

Seven standard lengths of casing and heating element combine to any room length —without cutting on the site—through use of telescoping, overlapping sleeves.

Full range of sizes, 2′ to 8′, in four cabinet types. Capacities from 2.9 to 11.1 sq. ft. EDR. Complete accessories to meet all practical installation needs. (See below.)

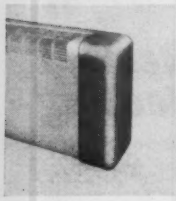
Optional equipment include knob-operated blade dampers, Nesbitt steam-distributing tubes for uniform heating with modulating control, and off-set adapters for convenient and economical steam trap connections.

Separate packaging of enclosures, heating elements and accessories facilitates selection, distribution and handling; offers the maximum protection from damage.

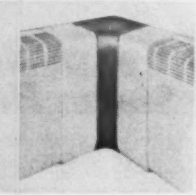
Nesbitt Sill-line Radiation

MANUFACTURED AND SOLD BY JOHN J. NESBITT, INC., PHILADELPHIA 36, PENNSYLVANIA

End Caps

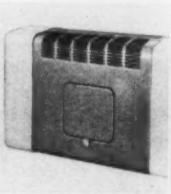


90° Inside Corner

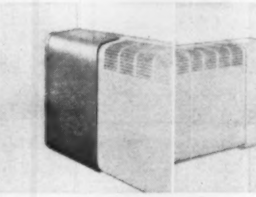


90° Outside Corner

Valve Compartment



Sleeves



Column Enclosure

"OPEN FOR DISCUSSION"

• *WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

"Improved Controls Studied for Dual Duct High Velocity Systems"

I WOULD LIKE to reply to N. J. Janisse's comments, in the February HPAC, on my article, *Handbook on High Velocity Air Distribution,* in the November 1954 HPAC.

In our survey of controls for dual duct systems, we found the damper method of static control generally unsatisfactory and, in many buildings, disconnected. When temperature controls were used, the systems worked in a satisfactory manner and were not unstable. If the damper method of static control is used on a high velocity system, engineers are cautioned to study the design very carefully, or the dampers may generate a lot of noise which will be difficult to eliminate.

Humidity control in dual duct systems is not obtained merely by dew point control of the cold coil because the air entering the room is a variable mixture of air from both the hot and cold ducts. In both high and standard temperature differential systems, the cold duct dew point can be allowed to fluctuate, and yet be limited, so that it will never be higher than a predetermined value. In general, on standard temperature differential systems, a limit will not be necessary.

If the flexiblity of dual duct systems is to be capitalized upon by placing an interior room on an exterior zone, it is only necessary to increase the air change rate in the interior room to obtain satisfactory conditions. Where rooms are interchanged with regard to zoning, the quantity of air can be changed by the "easy to use" balancing devices to compensate for the different zone control devices or methods.

Other factors which have a very important influence on the control of temperature and the static balance are the methods used when the system is originally balanced quantitively, the flow through the attenuator valves as related to their position of travel as they cycle, the probability factors and the duct sizing method. Although this may sound complex, some of the factors are self-compensating and all of the systems now installed are reported working in a satisfactory manner.

At the present time, we are preparing to set up all the variables on an analogue to determine the effect and influence of each one on the system's performance. We are also taking steps to place recording instruments on an actual system to obtain empiric data.

The use of volume controls on dual duct fans, as suggested by Mr. Janisse, is an excellent recommendation. In our mathematical analysis of dual duct systems, we found this control had definite advantages over static pressure controls of the fan.

We are sure that introspective analysis will produce improved controls and control methods, which will enable engineers to take full advantage of the thermodynamic and control characteristics of the high velocity and high velocity high temperature differential dual duct systems.

C. MILTON WILSON
Anemostat Corp. of America

"Suggest Lower Working Stresses and Pressure for Plastic Pipe"

IN COMMENTING on the article, *Plastic Piping Use To Increase,* in the December 1954 HPAC, I would like to offer some suggestions on the physical properties of plastic pipe materials.

The working tensile strength at 75 F listed — Table 1 — for the various materials seems to be somewhat out of order with the recommended working stresses agreed upon by the Thermo Plastic Pipe Division of The Society of the Plastics Industry. For polyethylene a figure of 400 is much more in order than the 540 shown, for acrylonitrile copolymer, 1200 psi, for cellulose acetate butyrate, 800. Inasmuch as polyvinyl chloride pipe is being made from two different materials, one modified and one unmodified, two figures are suggested. Modified polyvinyl chloride is generally designed along a working stress of 1200 psi, while unmodified PVC has a slightly higher stress value.

In Table 2 on plastic pipe data, I would like to suggest that the bursting pressure figures be completely removed, inasmuch as burst pressures on short term tests are a completely misleading figure as far as plastic pipe is concerned. Thermoplastic materials, being subject to cold flow, show burst figures which are so high compared to their actual rated pressures for long term use that, in my opinion, the values are meaningless.

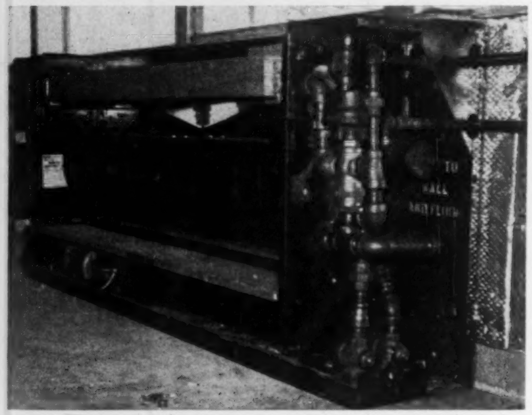
In the table on polyethylene, the working pressures as shown for temperatures up to 140 F are higher than those presently recommended by the Thermoplastic Pipe Division for room temperature.

As far as butyrate and acrylonitrile copolymer are concerned, by applying the working tensile strength or fiber stress suggested above, a revision of the working pressures for both butyrate and the copolymer blend are indicated.

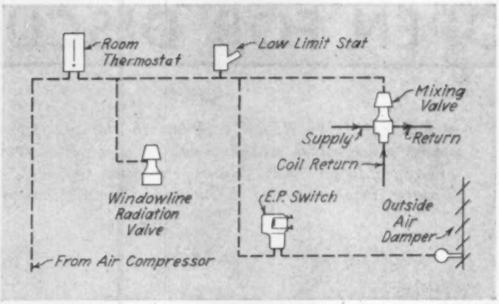
H. M. McDaniel
Assistant Manager, Pipe Div.
Plastic Sales
Republic Steel Corp.

"Each Unit Ventilator Has Own Three-Way Mixing Valve"

I wish to add to my reply to Samuel R. Lewis' comments, in the January HPAC, on my article, *Forced Hot Water Heats New School 5 Ways,* in the November 1954 HPAC.



MIXING VALVE is controlled by room thermostat



A THREE-WAY mixing valve is installed on each unit ventilator in the Eastport school, Michigan City, Ind.

One question Mr. Lewis raised concerned the mixing valves on the unit ventilators. Each unit has its own three-way mixing valve, as shown in the accompanying photo and diagram. A thermostat on the wall of the room controls this valve as well as the window line radiation valve.

Winston R. Kelley
Vice President
Eddy Isbey, Inc., Contractors & Engineers

"I Believe Consulting Engineers Should Stress Public Relations"

Engineers are notoriously inefficient when it comes to public relations.

The typical engineer is likely to go on year after year doing his necessary behind-the-scenes work as honestly and capably as he knows how, expecting that eventually his good works will find him out. However, in this age of publicity, he has to compete with others who have not hesitated to take the credit

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Require Stress Value

From time to time certain actions of the Sectional Committee B31 on the American Standards Code for Pressure Piping sponsored by The American Society of Mechanical Engineers, are published for the information of interested parties. While these do not constitute formal revision of the Code, they may be utilized in specifications, or otherwise, as representing the considered opinion of the Committee.

Pending revision of the Code for Pressure Piping, ASA B31.1-1951, the Sectional Committee has recommended that ASME, as sponsor, publish selected interpretations so that industry may take immediate advantage of corresponding proposed revisions.

Case No. 17 is published herewith as interim actions that will not constitute a part of the Code until formal action has been taken by the ASME and by the American Standards Association on a revision of the Code.

Case No. 17

Inquiry: Is it the intent of Par. 105(b) that an allowable stress — *S* values — for materials not included in Table 1 must be assigned before the material may be used?

Reply: It is the opinion of the Committee that the intent of Par. 105(b) is to require that a stress value assignment be made before such material may be used. In order to clarify the situation it is being recommended that Par. 105(b) and corresponding paragraphs in Sections 2, 3, and 4 of the Code, be revised in accordance with the wording:

". . . Should it be desired to use any materials or methods of manufacture not now covered by this code or which may be developed in the future, it is intended that the manufacturer shall provide details of de-for themselves. It is time, I feel, that he speak out.

Our professional societies can spearhead the drive, but it must also have the backing of each individual. Informational programs of professional societies directed to wide areas of the public are vital and necessary. An example of a current educational program of this type is the public informational project sponsored by architects in the American Institute of Architects. Group projects such as this should be an inspiration to engineers and their professional societies. There is no doubt that something needs to be done on a profession wide level which will acquaint the public with the services of the professional engineer.

It is at the level of day-to-day contacts with prospects and clients in our own offices that our public relations are so often bungled. Engineers are so often hypnotized by the term "public relations," they overlook the obvious fact that it is only another name for what clients and the general public think of engineers. Every engineer not only makes his own public relations but also those of his fellow members of the profession.

Doctors are often judged as having a good or poor bedside manner. There is no excuse for an engineer to be gruff or impatient. As much as possible, he should try to talk the client's language. Within reason, he should let the client know what he is doing, what progress is being made, and when there are delays what they are and why they arise. Misunderstandings with laymen most often arise because of the engineer's inability or failure to communicate with his client. His language may be too technical, or he may not have the patience or take the time necessary to explain complicated procedures to laymen customers and clients in words and images that are familiar and thoroughly understandable to them. The engineer often forgets that he operates in a rarefied atmosphere — of necessity — and that when he wants to be understood by those dealing in the non-technical aspects of his profession, he must speak the language of those to whom he is talking and make himself easily understood.

The type of public relations I am and have been advocating for our engineering profession is not just an informational program alone — as necessary as that is — but an enlargement of our appeals and a popularization of our services.

Engineering services are so vital and necessary that, basically, they are for volume markets.

In our own offices, we have begun to make our services available to volume markets as a first step in this program. Our feeling is that whoever needs us should be able to afford our services. Those who come to us may take our services on a modest retainer basis which will allow a minimum number of hours of consultation a year. This may even be bought on an installment-like, low-cost monthly basis if preferred. Ordinarily clients might consider their requests or problems as too small to waste our time. One of the greatest helps that arise from this plan is that we are called in early enough and long before the larger troubles start. This in itself is beneficial to prospects and clients, and in the preventive engineering point of view, contributes realistically to improved relations between the engineering profession and its public.

When those who use or need engineering services no longer have a reason to substitute inferior services for those that only professional and qualified engineers can give, they will respond wholeheartedly. This has been our experience.

Naturally, this is a program that will require the full acceptance of engineering clients on a volume

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for Piping Material

. . . code committee rules

sign and construction which will be as safe as otherwise provided by the rules of the code. Where it is desired to use materials not included in Table 1, written application shall be made to the committee fully describing the proposed material and the contemplated use, requesting that an allowable stress (S value) be assigned. Such materials shall not be used until the stress values have been assigned."

Air Conditioning Is Not a Separate Trade

. . . says the United Association

AIR CONDITIONING is not being recognized as a separate trade by the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry. This announcement was made by Peter T. Schoemann, assistant president of the association, at the Refrigeration and Air Conditioning Contractors Association convention at Miami Beach, Fla.

The contractors' association had been seeking UA cooperation for a special apprentice training program for employees of members.

Mr. Schoemann explained that refrigeration mechanics and apprentices, which now fall under the jurisdiction of the pipefitters, are given comprehensive training in the whole area of the pipefitting trade.

However, he added, after this basic training, the UA will cooperate in a post-graduate course in any special branch within the pipefitting trade.

basis. This, of course, is to supplement, not to supplant entirely, the conventional methods and relationships with clients as they now exist and have existed for many years. These will undoubtedly still go on as is, and I hope that they will continue to expand as more and more of the public is better informed as to the services and economies we offer. There is an entire new market waiting for us if we are sucessful in revising our sales and general approach.

We do not know how successful our own attempts along these idea lines will be. The old-time bugaboo of uncertainty with reference to engineering fees has been largely eliminated through a determined effort to do so. We feel that we are learning to serve clients better with a greater awareness of their acceptances, budget restrictions and needs. Our public needs a closer day-to-day association with the professional engineer.

No one would think of building without an engineer, yet the value of the engineer's services does not end when construction stops. In fact, his full use is just beginning. This is true whether you are speaking of industrial plants, hotels, institutions, commercial buildings or any other type of construction or business.

These are some of the levels on which public relations for the profession should proceed. How else can the profession obtain favorable public relations?

R. J. Abramson
Consulting Engineer,
R. J. Abramson and Associates

"Sub-Atmospheric Steam, Differential Controller Improve Unit Ventilator"

I wish to comment on Harold W. Alyea's article, *Controlling Unit Ventilators for Heating Schools,* in the November 1953 HPAC, and particularly on "Cycling Discharge Temperatures."

There are two basic handicaps which Mr. Alyea is trying to overcome: steam at 2 to 5 psi and an uncontrolled pressure differential between supply and return. Both of these handicaps can be eliminated by the use of sub-atmospheric steam and a differential controller. Not only would these handicaps be eliminated, but operation would be greatly improved.

The unit ventilator is required to produce a variable result to meet a varying requirement. If, instead of using a fairly inflexible or rigid heating medium — steam at a pressure of 2 to 5 psi — this medium were made flexible, how much easier it would be to get the desired result. This can be done by varying the steam pressure from 2 psi (218 F) down to as much as 25 in. of vacuum (133 F). This alone accomplishes a variation of heat output from the unit ventilator of 45 percent and more, without doing anything else. It also relieves the pneumatic control of that much of its burden. This results in that much reduction in the cycling action, which Mr. Alyea is worried about. To accomplish this, a control valve is installed in the steam main and governed by a thermostat responsive to outdoor temperature.

If, in addition, the vacuum pump is controlled so that it operates to produce a constant difference in pressure or vacuum between the supply and return mains, a great deal more of the cycling action will be eliminated.

In fact, all cycling action will be eliminated and outlet air temperatures will be stable. Very likely this would eliminate the need, also, for the "submaster thermostat." On top of all this, the reduced action required of the pneumatic devices would increase the life of such control and, in consequence, reduce the service calls and maintenance expense.

Lewis Smith
C. A. Dunham Co.

The author replies — Mr. Smith's comments on the second article of the series is partially answered in the fourth, in the January 1954 HPAC. Our experience with zone control of the steam system in conjunction with normal unit ventilator controls has not been encouraging because most such systems resort to intermittent operation during mild weather.

The idea of using a "flexible" heating medium, as Mr. Smith suggests, has merit and, in fact, is indicated as a refinement for hot water systems in the December 1953 article. This is only because it is relatively simple to accomplish and requires little more equipment than would be needed to maintain a fixed water temperature.

Control of a steam system to provide continuous flow, and at a pressure in accordance with requirements, while maintaining a constant differential, is another matter. A pressure controller which can be automatically reset from outdoor weather and a differential controller for the vacuum pump are required. The system must be carefully orificed to provide proper distribution at all reduced load conditions. A 25 in. vacuum on the supply side would require a vacuum pump capable of a still higher vacuum in the return, and systems tight enough to provide such vacuums are difficult to maintain.

There is no argument that such a system would reduce the burden on the unit ventilator controls. However, its chief contribution is not in providing a "flexible" system, but in providing a stable system under any given conditions. As mentioned in the January 1954 article, if such stable conditions are provided by employing a simple constant pressure reducing valve, and if the unit ventilator control valves are properly sized, excellent results will be obtained with the unit ventilator controls. Furthermore, it will not be necessary to incur the added expense of a "flexible" steam system as well.

Harold W. Alyea
Chief Field Engineer
Johnson Service Co.

Sparks Memorial Hospital

FORT SMITH, ARKANSAS

Another case of
COPPER
where it counts!

CARNAHAN AND THOMPSON ENGINEERS—Mechanical and Electrical Consultants, Oklahoma City, Okla.; G. W. SHIRLEY & SON—Mechanical Contractor, Van Buren, Ark. FRASER CONSTRUCTION COMPANY, INC.—General Contractor, Fort Smith, Ark. E. CHESTER NELSON—Architect, Fort Smith, Ark. CRANE CO.—Revere Dist., Fort Smith, Ark.

28,000 lbs. of Revere Copper Water Tube used for air and oxygen systems, hot and cold water lines

Here is an interesting example of the versatility of Revere Copper Water Tube. Because of the characteristics of copper tube it can be used to carry various fluids and gases encountered in hospitals without frequent replacement which would be necessary should rustable pipe be used. Also, the solder or compression fittings used with copper tube assure the tightest kind of joint possible, preventing dangerous leaks. Just check the many outstanding features of Revere Copper Water Tube in panel at right and you'll see that there is not another metal, alloy or other material that has all the outstanding construction characteristics of copper. Yet its initial cost, though slightly more in some cases, is much less per year of service.

Keep out of trouble with copper. Use Revere Copper Tube for air conditioning lines, radiant panel heating, hot and cold water lines, underground service lines, waste stack and vent lines, processing lines.

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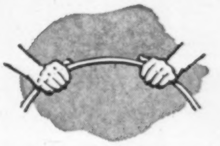
Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.
Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.

WHY REVERE COPPER WATER TUBE IS PREFERRED BY—

Architects, Builders, Plumbing & Heating Contractors



EASY TO BEND

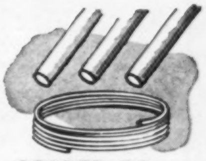
Saves Time

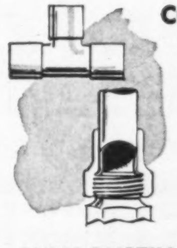
Revere Copper Water Tube is easy to bend. Soft temper can be bent by hand to meet installation conditions.

HANDY LENGTHS

Save Fittings . . . Labor

Revere Copper Water Tube comes in straight lengths of 20′ in hard and soft tempers. 60′ coils of soft temper reduce the number of fittings needed.





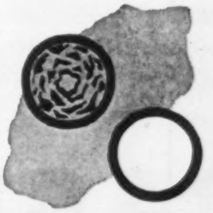
SOLDER OR COMPRESSION FITTINGS

Need Less Work Room . . . Save Metal

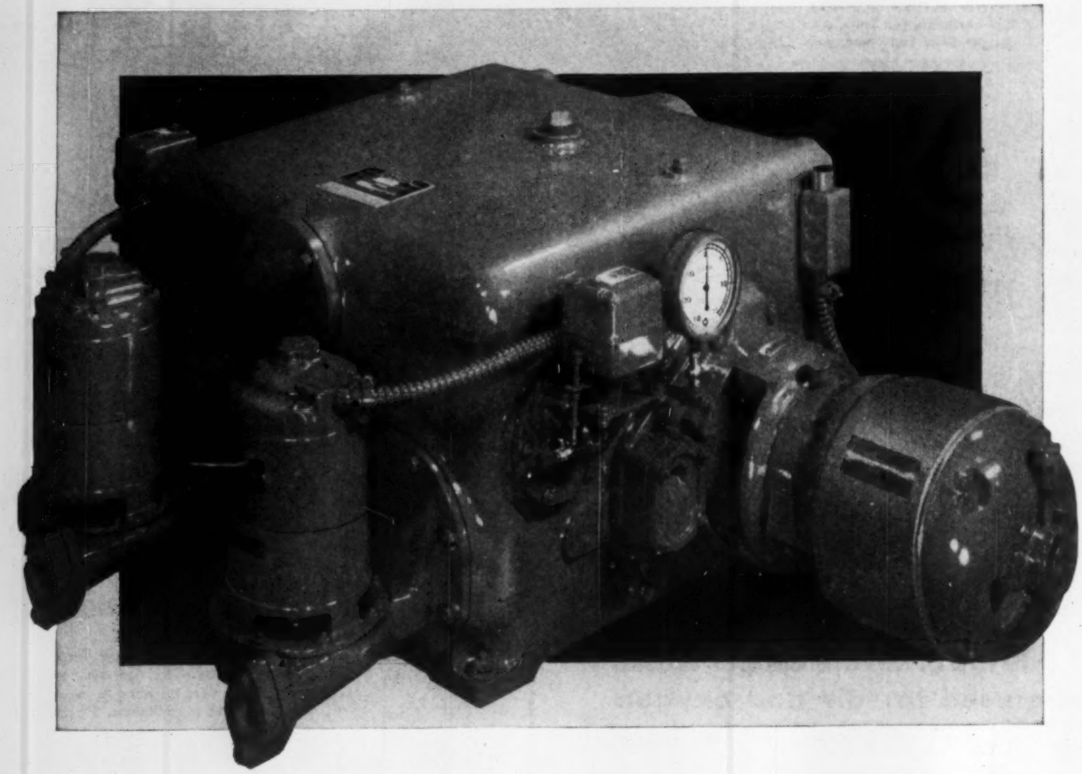
No worry about wrench room when you use Revere Copper Water Tube with solder fittings. Compression fittings can also be used. No threading is necessary with either type fitting. Wall thickness of tube used can thus be less than for threaded pipe.

NON-RUSTING

Rustable pipe eventually clogs as shown in drawing at top right. Non-rustable Revere Copper Water Tube suffers no loss of flow or pressure as shown at bottom right. No allowance in pipe size need be made for rust accumulation with Revere Copper Water Tube.



THIS NEW VACUUM HEATING PUMP IS SIZED TO ACTUAL JOB REQUIREMENTS



It's the Nash CSM

No longer is it necessary for the Engineer to accept a vacuum heating pump with air and water capacities based inflexibly upon square feet of equivalent direct radiation. With the flexible Nash CSM he can provide for proper air capacity in accordance with his judgment and experience. For the individual capacities of the separate pumps on the CSM may be varied within a wide range, without buying an oversize receiver and oversize water pumps.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low, returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- ✓ **Increased air capacity induces rapid system response without wasteful overheating.**
- ✓ **Separate air and water pumps individually selected to meet actual job requirements.**
- ✓ **Control system that operates individual pumps only when needed.**
- ✓ **Flexibility permitting addition of radiation without changing basic pump installation.**
- ✓ **Low, low, return line connection.**

NASH ENGINEERING COMPANY
438 WILSON, SO. NORWALK, CONN.

World's Biggest Underground Garage

. . . features extensive ventilation, ramp snow melting and two types of heating

By Ralph H. Burke
Consulting Engineer

THE WORLD'S LARGEST underground garage, 2360 car capacity, was completed recently in Chicago's front yard. It cost $8 million. To all outward appearances, the only changes apparent are the four entrance and exit ramp balustrades rising into Michigan Ave., which also serve to guide traffic from the busy loop area. Grant park, with its trees, gardens and walks, still offers a beautiful contrast to the bustling scene of Chicago's skyscrapers.

The garage was placed in an area which by law must be preserved as a park. It extends three blocks, with Michigan Ave. on the west and the Illinois Central railroad on the east. The streets, sidewalks, dirt, sand, clay and utilities were removed to a depth of 23 ft below grade. Approximately 350,000 cu yd of excavation were required on the 1250 × 320 ft site. A history of Chicago could be read in the items uncovered: abandoned cable car vaults, wooden pipe, cobblestone, gas light piping, relics from Chicago's tragic fire, and sea shells and sand, indicating the long ago shoreline of Lake Michigan.

In this area, the 880,000 sq ft garage was built and covered with streets and sidewalks, and Grant park was restored as it was before. Now, however, 4 ft below the park a clean, well ventilated parking area is provided close to the center of the business district. Two main floors and a mezzanine level accommodate over 2300 cars, in 29 × 29

1 AIR EXHAUST chambers, like the one at left, house the discharge fans. These shafts are along the east limit. Air intakes may be seen at the upper right along Michigan Ave.

2 LOUVERED AIR INLETS are in the backs of concrete benches. The plenum chamber extends below the street. HPAC's offices are in the building at left.

ft bays. The Chicago Park District operates and controls all functions, including heating, lighting, ventilation and service.

Power, light, water, fire protection and sewage services had to be maintained during construction for the skyscrapers along Michigan Ave. And traffic, extremely heavy, had to be routed around the area over temporary roadways.

Walls, floors and columns are of reinforced concrete. The entry control center, waiting rooms and locker rooms are finished in glazed tile and glass set in aluminum.

Escalator stairs provide easy egress for patrons.

The heating, ventilation, and snow melting designs are peculiar to the building usage and to the area in which the garage is located. Since no structures are permitted to project into the park above grade, a central power station was out of the question. Purchased steam was decided upon when it was found that the Pittsfield building, one block west of the garage, had ample capacity in its boilers to meet the garage requirements.

Heating System Is Zoned

Heating in the garage is confined to waiting rooms, ticket offices, locker rooms, escalator pits to the outside sidewalks, and the snow melting systems on the four ramps to the street level. City water lines, exposed on the north wall of the garage, are wrapped, heated with electric induction wiring, and insulated. Other areas have provision for electric heaters if needed.

A 5 in. steam supply and a 2½ in. return connect into the header of the supply boilers behind a reducing station. Steam pressure is further reduced to give a constant pressure of 10 psi. Piping from the Pittsfield building passes through the basement of another building, out under the streets and into the plenum chamber of the garage's outdoor air intakes. The wrought iron piping is insulated and has mechanical expansion joints. Termination of the steam supply is at two utility rooms, which house equipment to convert the steam into hot water systems. The steam is metered with recording flow meters at the source.

The heating is zoned into three separate and integral systems: (1) the waiting rooms, (2) the north ramps, and (3) the south ramps. All are basically the same, employing steam convertors to a forced flow hot water system. However, because of temperature contingencies, a 50-50 mixture of ethylene glycol and water is used as the circulating medium instead of straight water. There-

. . . A ramp snow melting system with full length reverse return pipe coils is imbedded in the two entrance and two exit ramps . . .

fore, with no direct connection for automatic make-up, extra care was taken to secure a tight leakproof system. Chemical consistency is tested according to a regular maintenance schedule.

The waiting room areas are heated for design conditions from −10 F to 65 F with forced circulation by standard circulating pumps. Finned pipe radiation perimeter heating around the glass enclosed area is installed behind planting boxes. Grilles flush with the plant boxes diffuse the heat over the glass area. All piping is concealed. Risers and returns are carried on the ceiling below in the garage area. In addition, combined heating and ventilating self contained units in the outer walls supply heated air, outdoor make-up air, recirculated air or any combination of each. These are individually balanced and controlled. Wall thermostats throughout the area control the temperature. Wall radiation, where used, is of the convector type, flush mounted.

It was neither economical nor feasible to extend the central steam supply, or to branch from the circulating system to the end ticket offices. These offices are heated by thermostatically controlled electric strip heaters. Circuits to plug in more strip heaters are in the floors if booths must be moved to accommodate different traffic pattern.

The treads of the outside escalators are heated from below by an air blast from unit heaters. This was necessitated because the escalators rise up into the sidewalk of Michigan Ave. and are not covered. Snow, ice and rain do not impair the continuous function of these units.

Ramp Snow Melting

All four ramps — two entrances and exits — have panel heating with full length pipe coils. From the entrance ramps, the imbedded coils extend into the ticketing area to melt ice or snow falling from cars.

The ramps are of 6 in. reinforced concrete, with a 2 in. top layer of asphalt and 2 in. thick insulation on the underside. Embedded 2 in. below the concrete surface, the pipe coils are actually 4 in. below the finish face. These coils are of the sinuous type, of ¾ in. wrought iron pipe, welded. Each coil covers an area approximately 90 sq ft. In the open or unprotected part of the ramp the pipe coils are on 12 in. centers and the balance are on 18 in. centers. Coils in the ramps are about 254 ft long from street to concourse.

The system is a reverse return type, and each coil is valved with a balancing cock at the point of take-off and return for modulation or complete shut off. A manual bleeder vent rises from the high point of each coil up through a sleeve to the ramp curb. It is possible to control the snow melting at any point in the system. The entire coil system is filled with the ethylene glycol mixture from fill pipes on the balustrades on Michigan Ave. Two ramps are controlled from one heat exchanger and a set of standard circulating pumps.

Design conditions were based on 150 Btu per sq ft per hr on the exposed ramps and 100 Btu per hr on the balance for melting 1 in. of snow per hr with a circulating temperature of 150 F.

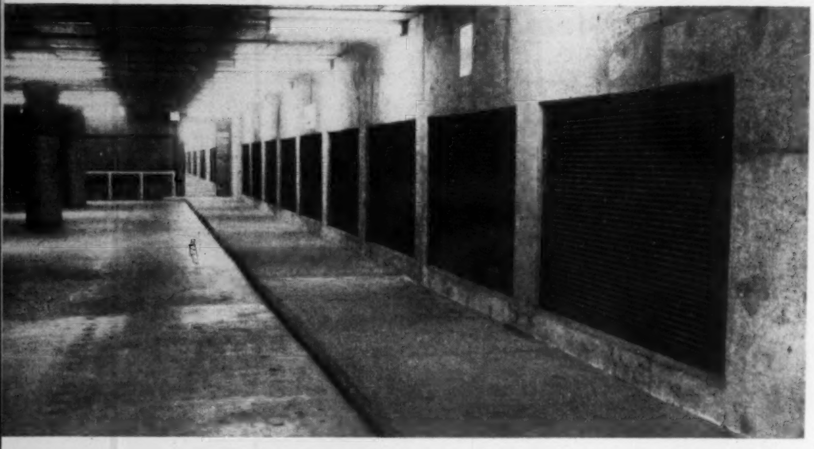
Full size trench drains which cross the ramps in two places, plus a grating at the check point, take care of water from rain or snow melting.

Control of the ramp heating is manual — on or off. A warm up period of approximately three hours is required from a cold start to maximum efficiency. Maintenance personnel turn the units on for expected inclement weather. The waiting room system differs from the ramp system in that an indoor-outdoor thermostat controls its function.

The entire heating system was designed for a minimum amount of service with the smallest number of maintenance personnel.

2-17
Coca-Cola

3 TWO SNOW MELTING ramps are controlled by one heat exchanger and a set of standard circulating pumps



4 OUTDOOR AIR INLETS extend the length of the garage on both levels. They open into a plenum chamber which receives outside air from the louvered benches above grade

> ***" . . . There have been no problems of gas fumes, carbon monoxide or oil smoke thus far."***

Flexible Ventilation System

The garage is ventilated by a mechanical exhaust system with zone control. Air movement is across the short axis of 300 ft. It consists of 28 horizontally mounted tubeaxial fans along the west wall. The discharge air is blown up vertically adjacent to the Illinois Central railroad tracks on the east. The two floors below grade and the mezzanine are divided into sections by fire walls. Arrangement of the fans is such that these sections each have openings to four fans, two on each corner of the west wall.

It is possible to control the fan operation from the manager's office. A pilot light panel with pushbutton start indicates the areas or fans in service With all fans in service, the total fan capacity is 1,766,400 cfm, or a possible air change every three and a half minutes.

This air flow rate will permit constant engine idling for better than 10 percent of the total capacity without causing a change in normal air conditions, and over 1100 cars have been handled in one hour without a change.

The outdoor air supply is admitted through aluminum louvers in the backs of specially designed concrete benches up in Grant park, and in reconstructed parapet walls above grade. Beneath grade and above the east wall ceiling, a plenum chamber extends the full length of the garage. This opens to a vertical chamber, from which air is admitted to the parking area. Velocity of the air at the inlet and exhaust openings is approximately 500 fpm. At the fan discharge it is 45 mph.

The total fan horsepower is 680. The fans are 5 ft in diameter, but the housing openings are 7 ft. In the event of fire, fire dampers close the fan opening automatically and turn the fan off.

The waiting and locker rooms have separate air handling units that use the same sources of outdoor air. A large volume of outside air entering through the ramps chills the ramp surfaces in cold weather. This is compensated for by the radiant coils extending into the ticket area.

Operation to date has been completely satisfactory. The flexibility of the ventilation, with no problems because of gas fumes, carbon monoxide or oil smoke has warranted using a relatively high 15 air change per hour design.

Drainage Is By Sump Pumps

The mezzanine, upper and lower parking levels have 14 in. heavy duty floor drains in each bay. The entrance ramps and the check-in points have large grating type floor drains. The stairways, escalators, waiting rooms, toilets, outdoor air intakes, exhaust chambers and the plenum chambers have 4 in. conventional drains. All these drains are tied into a system which carries the water to oil separators and thence to the sump pumps.

These duplex sump pump units are made up of four 3 hp heavy duty vertical submerged centrifugal pumps with capacities of 200 gpm. The two units operate alternately, with both performing when the demand requires an output of 400 gpm.

Fire Protection System

The garage is protected by a 6 in. water supply line, looped in a grid system and fed from two sources of city water. This line is below the lower level floor and has riser pipes extending up into the garage. At these extensions, fire hose cabinets are located with 100 ft lengths of hose. The riser pipes are dry normally but are energized by a large handwheel at the cabinet. In addition, CO_2 cylinders are spaced throughout the garage area.

In addition, an automatic fire pump on the lower level keeps 100 lb pressure on the fire line to give a minimum of 200 gpm delivery at the fire control stations. To supplement this, there are two standpipes, one at each end of the garage, which can be connected to the city fire department pumpers.

M. J. Holleran, Inc., was the heating contractor, and The Haines Co. was the ventilating contractor.

Discuss Plant Maintenance

. . . at recent conference

TWENTY-FIVE thousand visitors from all over the country and 15 foreign nations attended the sixth annual Plant Maintenance and Engineering Show, in Chicago, topping previous attendance records by 15 percent.

Simultaneously, 2500 engineers and production executives met for the Plant Maintenance and Engineering Conference, held in conjunction with the show.

Factory upkeep cost $10¼ billion in 1954, according to L. C. Morrow, show chairman. He said this is a conservative figure, based on a study of plants all over the country.

He predicted that advances in maintenance will consist of placing the work on regular schedules, of standardizing work routines and in controlling costs.

Five industries received special attention and separate two-hour round table sessions devoted to their problems. These included chemical plants, food plants, paper mills and paper product plants, steel mills and textile mills.

What Management Wants from Maintenance

IN ADDITION to knowing what management wants from a maintenance program is the problem of how to get it, according to Robert E. Horstman, plant manager of Robbins & Myers, Inc., Springfield, Ohio. This applies in the field of heating, piping and air conditioning as well as in other fields. The answer to the problem of getting what you want from the program lies in the people who are to do the job, he said.

The men on the maintenance team must have a combination of personal characteristics, mental attitudes and spirit needed to do the job. To develop a good team, Mr. Horstman suggests first setting down the things you want your program to accomplish. Then along side of each one, write down the characteristic needed to do that job.

Some of the main objectives and qualities needed are:

1) Uninterrupted operation of production equipment — Foresight.

2) Equipment kept in condition to hold quality standards — Skill.

3) Safe operation of equipment — Human interest or regard for the other fellow.

4) Low cost production from plant in relation to dollar outlay and shutdown cost — Ambition.

5) Accurate budgeting of maintenance costs — Self discipline and drive.

6) Accurate planning and scheduling of maintenance operation — Organizing ability and determination.

7) Minimum inventory of spare parts, equipment and supplies — Good judgment.

8) A minimum of paper work — Directness and a broad viewpoint.

9) Low cost housekeeping with the right amount of mechanization — Sense of responsibility, ambition, good judgment.

10) Working conditions that will make for good worker morale — Human interest and helpfulness.

11) Maintenance supervisors who know how to handle workers — Fairness, discipline.

12) Accurate and complete reports of maintenance operations and costs as soon as the work is completed — Honesty, accuracy, promptness.

But having all the characteristics wouldn't be enough, Mr. Horstman concluded. What is needed is to have all the talent welded together as a smooth working team. What management really wants is for the maintenance team to compare their abilities and attitudes with those required, putting to good use what they have, and then developing those abilities which they do not have.

By thus working together, setting up their goals and helping each other to reach them, they will be welded into a smooth working team.

Reducing Maintenance of Heating, Ventilation

"MAINTENANCE and construction of plant buildings should be and is a real part of management," declared W. E. Chandler, plant manager of the Monsanto Chemical Co.'s John F. Queeny Plant in St. Louis.

But in many cases, he said, the best solution may be simply not to construct a building. The petroleum industry has been a pioneer in this, and the chemical industry is moving in the same direction. In a current case, an expensive building is being dismantled from around a manufacturing department because the building is excessively expensive to maintain, and it increases the hazard of operation without providing any real economic advantage. With the modern techniques of continuous processes and automatic controls, the basic approach of the design engineer should be to so design the plant that a minimum of enclosed structure is required.

Improve Existing Buildings

Probably the biggest cause of failure of brick walls outside foundation failures, he said, is the damage frequently caused by improperly hanging pipe line equipment and "what have you" on the walls. Such items tend to weaken the wall structurally and permit penetration of moisture and fumes and, at times, make the walls completely inaccessible for maintenance work.

Windows are one of the most expensive building maintenance items. So, the design engineer should be encouraged to question the necessity of installing windows at all. Of course, they are required in many cases. For example, in the chemical process industry where flammable solvents are used, windows are necessary to provide adequate explosion vents.

Forced Ventilation Economical

Ventilation is another problem in any plant building and is particularly acute in the chemical industry. A former approach of installing roof dormers and depending upon natural ventilation has not proved satisfactory. The installation of these items has in itself resulted in high maintenance costs, as well as contributing to the roof maintenance problem.

A well-designed forced ventilation system, although it involves some added operating costs, appears to be a far better solution in the overall economics. The use of plastic materials in the fabrication of ducts and coating of exhaust vents can lead to low maintenance costs.

Heating Design Problem

The heating of industrial buildings has always been a major problem, too, said Mr. Chandler. It is not always necessary that the entire enclosed area be heated. Enclosed control rooms can be built inside a building and properly heated without heating the entire area. Too, spot heating can be installed at crucial operating points. This approach will frequently lead to lower installation costs, considerable reduction in operating costs and lower maintenance costs. In addition, individual heating units can be taken out of service without disrupting the system.

A scheduled preventive maintenance program will achieve a higher level of maintenance.

Corrosion of Piping, Tanks Claims Interest

THE ANNUAL cost of corrosion to American industry is over $5 billion, estimates John L. McPherson, materials engineer, Chemical Plants Div., Blaw-Knox Co., and discussion leader of a conference on corrosion control and prevention at the Plant Maintenance and Enginnering Conference.

The corrosion conference was one of 16 round table discussions on specific areas of maintenance.

"This financial outlay greatly reduces the profits of industry, increases production costs and represents a tremendous waste of our natural resources," Mr. McPherson said.

Brought up for discussion and exchanges of information were typical corrosion problems in a variety of plant and field installations. They included corrosion of pipe lines and tanks in acid, gas and water services by the atmosphere, by fluids and by soils.

For corrosion prevention, conference members recommended the use of special corrosion resistant metals, plastics, glass, rubber, protective coatings and cathodic protection.

"Protective coatings alone," said Mr. McPherson, "cost American industry $2 billion a year."

Rubber Lined Tanks for Acids

Rubber lined carbon steel was recommended as an immersion coating for muriatic acid and for sulfuric acid up to 50 percent at atmospheric temperature. Rigid polyvinyl chloride is also satisfactory, it was reported. Sheet lining is necessary, it was emphasized, since a painted coating for these services would be too thin.

"As for hydrochloric acid in rubber lined tanks, watch out for organic byproducts, which attack rubber," warned Mr. McPherson.

For the satisfactory use of steel for muriatic acid at 215 F, a copper inhibitor was suggested.

Using Cathodic Protection

The use of a zinc or graphite anode for cathodic protection depends on the acidity or alkalinity of the soil and on its moisture content. Most new city water lines are cathodically protected.

"Should cathodic protection be used on elevated water tanks?" asked one conferee.

"It's O. K.," was the reply. "When we use it, we put a protective coating on first. Use a magnesium or zinc anode to protect irregular surfaces."

Importance of the proper application of protective coatings was stressed. The prime coat should always be brushed to get down into crevices better. The second and third may be rolled or sprayed. If multicoats are used, two or three different colors should be used to assure complete coverage.

A problem of pump erosion was brought up by the engineer of one company which uses a hard, ground rock material as a filter aid for chemical solutions. For longer life, the bodies, casings, and all parts of these pumps are of stainless steel. Rubber lined pumps have been considered by him but not tried as yet.

Welded and Screwed Joints

Conference members expressed preference for welding for acid lines. One engineer reported using screw joints because of the lack of good welders on the maintenance staff.

If screwed fittings are used, cutting tools must be sharp; otherwise, threads will not seal.

With flanged joints, gaskets must fit perfectly to avoid crevice corrosion, cautioned Mr. McPherson.

Draining Acid Tank Sludge

"What is the best way to remove sludge from a carbon steel tank of concentrated sulfuric acid?" asked another engineer. Draining the tank at least once a year was advised, to avoid preferential pit corrosion beneath the sludge. First drain the tank, then flush it out with water and dry it immediately, or the dilute acid will corrode the tank rapidly. Purging the tank with dry nitrogen at 100 F was recommended. Another drying agent used is soda ash.

"How much sludge is there in a tank that has not been cleaned in 10 years?" asked an engineer. "A lot !" quipped Mr. McPherson.

A major cause of corrosion is stress, the conference was told. Stress relieved welds — by treatment in ovens at 800 to 900 F — will resist corrosion by 98 percent sulfuric acid.

Steam tracing sulfuric acid lines was reported safer and cheaper by an electric resistance heater or insulated copper tube than by a flame.

To avoid contamination by the erosion of steel by sulfuric acid, lead or a glass lined tank was recommended.

Plastics Receive Attention

Plastic materials for piping and ducts received attention also at the corrosion conference. Special advantages of plastic were discussed as were some disadvantages. Plastic ducts of fiber glass reinforced polyester or unplasticized PVC were reported to give satisfactory service, for 18 to 24 months, for pickling tanks containing sulfuric acid.

While plastic pipe is sometimes thought expensive, it actually may be no more so than other materials when its unique advantages are considered.

Plastics were reported satisfactory for small instrument lines, but a common type in this service was said to be flammable and brittle.

One engineer reported that a truckload of plastic pipe was so damaged by cracking that it was sent back for another load of new pipe. Newer plastics were reported to have more impact resistance.

One type of plastic pipe once used by one chemical company for lines carrying acetic acid and amines and for processes subject to acid and alkali corrosion, has been replaced with stainless steel and brass. The reason was that the screwed fittings leaked. The company still uses the plastic for sulfuric acid, however.

Plastic Protective Coatings

Plastic protective coatings were also discussed with interest.

"What advantages do vinyl protective coatings have?" inquired one conferee. They are especially good, was the answer, where acids like chromic and nitric are handled, where other protective systems fail. Vinyl was also suggested as a third coat to prevent corrosion around sewage treatment plants. The first and second coats would be chlorinated rubber and neoprene, in the method suggested.

Polyvinyl tape, which is pressure sensitive, was reported in satisfactory use on underground gas lines. It is used in 4 or 6 in. widths. A primer improves the adhesion.

Maintenance Must Be Standardized

"MAINTENANCE methods must be standardized," declared Frank O. Pierson, chief manufacturing industrial engineer, industrial engineering division, at the Point Breeze refinery of the Atlantic Refining Co., Philadelphia. But some people find it hard, he said, because they are wedded to the thought that maintenance is unpredictable.

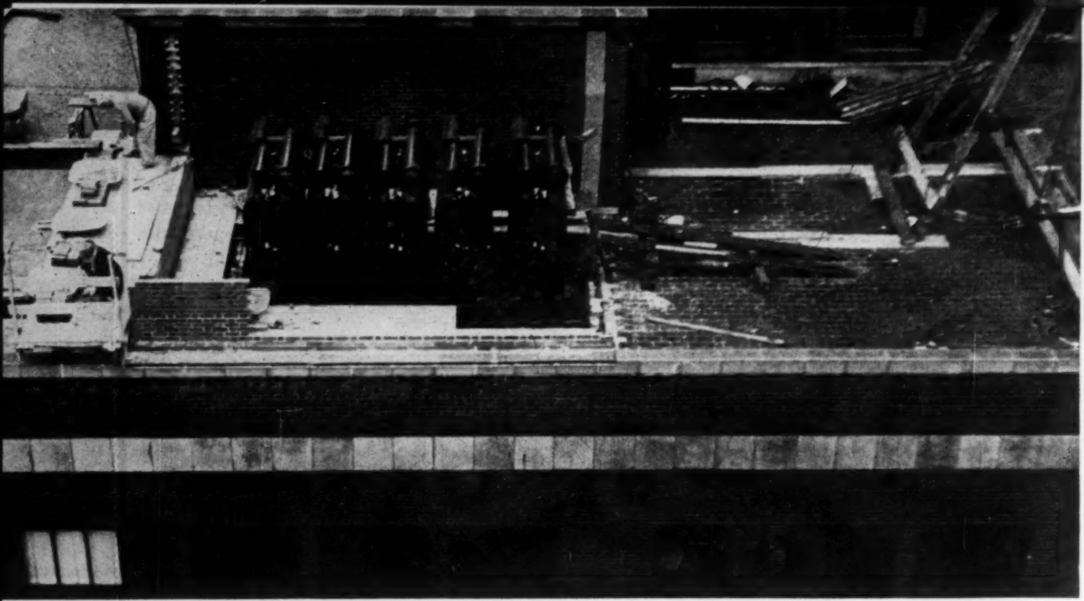
Preventive maintenance is based on predictions and the philosophy that it is cheaper to anticipate breakdown, he said. Eighty-five percent of his company's maintenance work is predicted work, and a good part of the repair work is anticipated.

Despite good preventive maintenance practice, Mr. Pierson reports, they have an occasional breakdown. Being unexpected, they are usually emergency jobs. There is also equipment repair work. If a pump fails, the standby is put to work. The down pump is fixed promptly, for if the second pump were to fail before the first was repaired, a processing unit would come offstream. Although not rush, this is hurry-up work.

Some maintenance work is not done by the mechanical department. Troublesome but short jobs such as packing pumps and lubricating engines, tricky jobs on special equipment such as glass piping and machinery adjustments are done by resident mechanics, trained for these specialized needs. These men, always in those areas in case of emergency, are members of the operating groups and report to production supervision.

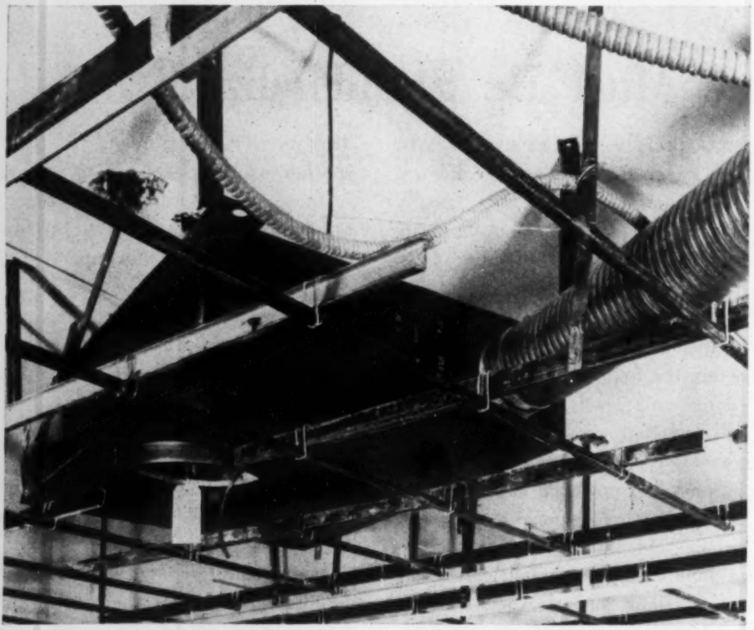
"If you believe maintenance is nonrepetitive, you will find training and planning your work difficult and expensive," Mr. Pierson said. "We train our welders with the knowledge that any ½ in. V groove horizontal butt joint is like all others. When you've done one of them, you can do them all. And we make a lot of these welds in a year's time."

Standardization, he said, is the foundation stone of their program. Labor measurement and control is difficult without standardization.



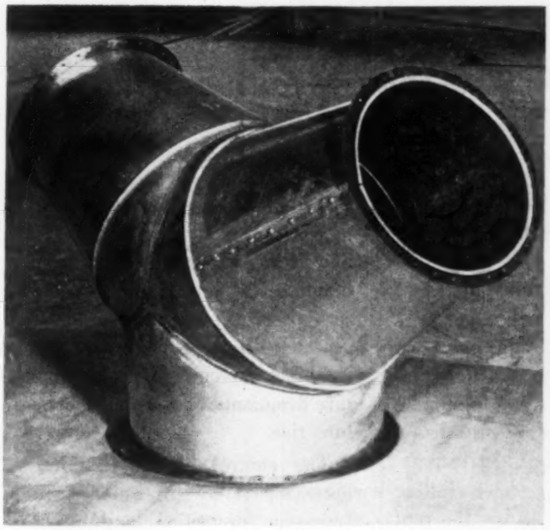
1 ABSORPTION WATER CHILLERS were installed on the roof above the office floor. They were later enclosed in a penthouse

Air Conditioning Adds Life To Old Office Building

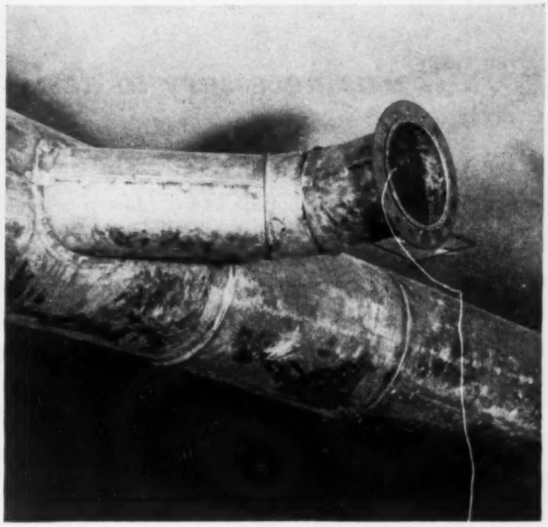


2 SOUND ATTENUATING BOX reduces velocity of air before diffusion at design quantity. Flexible tubing from take-off points minimizes vibrations

By Nathan Feder
Consulting Engineer



3 ROUND GALVANIZED SHEET METAL iron ducts were rolled, with locked seams riveted and soldered



4 SHARP ELBOWS AND BENDS were avoided. Duct joints, with flanges and flange rings, have airtight rubber gaskets

. . . steam absorption refrigeration units and high velocity air distribution were chosen to meet problems of space restrictions, and inadequate wiring, and to minimize alterations

No. 200 Madison Ave. is a typical metropolitan office building of the kind built in New York and other American cities 30 to 50 years ago — a bulky concentrated mass with a 200 ft front and slightly larger depth, divided into many stories, with all upper floors occupied by different tenants. The typical upper floor plan of the building shows a series of connecting offices on the outside, while the artificially lighted and ventilated core of the building is given over to elevators and rooms for conferences, storage spaces and similar rooms. The need to air condition buildings of this type is particularly great, because air conditioning — in addition to its other advantages — helps to offset the disadvantages of the small windows and deep dark floor spaces of these buildings.

A tenant occupying an entire floor wanted his offices air conditioned. These offices are on the ninth floor at the first set-back of the building. The structure begins receding at this floor, and space is at a premium. The space available in the hung ceiling is restricted. In addition, the ceiling contains steam mains and returns of the heating system.

It was realized, therefore, that it was impossible to accommodate conventional ducts in the ceiling and that a new approach in duct design would have to be made to fit the ducts into the cramped ceiling space. Also, consideration would have to be given to insure a minimum of cutting and breaking of ceilings and partitions. All ceilings were to remain without alteration except on the Madison Ave. side, where a new ceiling was to be installed. Furthermore, it was decided to make use of the existing ventilation system.

Another problem was the lack of sufficient electric wiring to provide adequate power for mechanical refrigeration equipment. To install a new feeder to this floor would have entailed an expensive electric installation.

Air Conditioning Design

After studying various types of air conditioning systems, it was decided to use a single duct high velocity system, with high velocity units consisting of sound attenuating boxes and aspirating air diffusers. Since high pressure steam is available in the building, a steam absorption refrigeration plant was selected which made the installation of a new electric feeder unnecessary.

As the floor is exposed on all four sides, it was necessary to de-

“. . . It was necessary to design for five zones—four outside and

sign for five zones — four outside and one interior. Space restrictions made it extremely difficult to install reheat coils in each zone branch. Therefore, it was decided to use partial reheating. A portion of the supply air from each zone is passed through a reheat coil of sufficient capacity to raise this air to a temperature sufficient to give the desired reheat temperature when it is mixed with the balance of the air.

The system satisfied the following requirements:

1) Cooling and dehumidifying of the individual spaces in the summer months, tempering of the supply air in the winter months.

2) A satisfactory rate of ventilation in the individual spaces.

3) Acceptable air cleaning.

4) Freedom from noise.

5) Simplicity, compactness and economy of design to keep first cost low, and to keep need for maintenance and replacement of parts at a minimum.

With outdoor conditions of 95 F DB and 75 F WB, indoor conditions are maintained at 78 F DB and 63.5 WB — 45 percent relative humidity — with the fan handling a minimum of 25 percent outdoor air. When outdoor conditions permit the maintenance of indoor conditions between 78 F DB and 63.5 WB — 45 percent relative humidity — and 70 F DB and 55.8 F WB — 40 percent relative humidity — by using more outside air, the fan handles up to 100 percent outdoor air.

Description of System

The system consists of: (1) The air conditioning plant with fan and motor, cooling and heating coils, and auxiliary equipment; (2) The refrigeration plant, consisting of five steam absorption water chilling units; (3) The high velocity air duct system and the return duct system for air transmission; (4) High velocity units for air distribution; and (5) Control equipment.

The air conditioning equipment is on the office story. The fan is a slow speed centrifugal airfoil fan, class 2. The fan capacity is 36,500 cfm, at 5½ in. WG static pressure, and the outlet velocity is 3970 fpm.

The five absorption water chilling units are in a penthouse on the roof above the office floor. Each unit has a capacity of 20 tons and requires 413 lb of steam per hr. Water enters the evaporator at 50 F and leaves at 40 F.

The relatively light weight and compactness of these steam absorption units allow them to be placed side by side, keeping the machine room size small. Also, the lack of vibration and light weight allow them to be supported on light steel beams directly over the office space without any danger of noise penetration.

Condenser water is supplied to these units from a specially designed cooling tower. Three hundred gpm are delivered to the condensers at 85 F entering temperature and 105 F leaving temperature. Because of this 20 F differential, it is important that the cooling tower have enough vertical height as well as the correct amount of cross sectional area and sufficient air quantity to insure complete mixing of the air and falling water in the tower.

Steam pressure in the main supply to the units is kept at 10 psi by means of a pressure reducing valve. At the supply entrance to each unit is a plug cock to reduce the main pressure to practically atmospheric pressure as the steam enters the unit.

The control of the load on the units is in series. A program controller operated by an immersion bulb in the leaving chilled water line operates in sequence a control valve on each unit which modulates from 100 percent capacity to 50 percent. Should this not control the water temperature, the valve then closes to the zero percent position. This cycle is repeated in sequence with all five machines on chilled water temperature drop, and it reverses on temperature rise.

The control circuit contains all necessary safety protection such as freeze-up protection and interlock with the chilled water pump and cooling tower fan and pump.

The steam absorption units are hermetically sealed and use water combined with lithium bromide as the refrigerant medium. No insulation is required on the units because of the chiller construction. The cost of operating these machines per ton is relatively low because of the straight line relationship of load to steam consumption for the first 50 percent of load.

High Velocity Ducts and Units

In designing the duct system, the rules of good design have been followed. The ducts convey the air as directly as possible, sharp elbows and bends are avoided, and transformation pieces have been made as long as practicable. In addition, splitters and turning vanes have been used to reduce losses.

The recommendations of the American Society of Heating and Air-Con-

TABLE 1—DUCT SYSTEM of galvanized sheet metal iron consists of the following gages

Rectangular ducts		Gage
One dimension, in.		
up to 12		24
12 to 29		24
30 to 47		22
48 and over		20
Round ducts		
Diameter, in.	Ducts	Fittings
up to 8	24	22
over 8 to 18	22	20
over 18 to 30	20	18

one interior."

ditioning Engineers for duct construction were followed. Round ducts were rolled, with locked seams riveted and soldered. Ducts were joined with flanges and flange rings, which are made airtight by the use of special rubber gaskets. All ducts are suspended on galvanized iron hangers.

To minimize vibrations, and for easy relocation of high velocity units, connections between take-off ducts and units are of flexible tubing.

Ninety-two high velocity units are installed in the various rooms which introduce the air through diffusers. Primary air reaches the units at high velocities and static pressures. These velocities and pressures are greatly reduced in the units before the air reaches the diffusers and the velocities are further reduced by the diffusers. Each unit consists of a sound attenuating box equipped with a combination static pressure and velocity reducing valve which reduces the velocity to an acceptable limit before it reaches the diffuser, and also permits ready balancing of the unit for the delivery of the design air quantity regardless of the duct static.

All velocity units are installed in the ceiling. Some have automatic volume control to allow for individual control in special rooms.

It is of interest to note here, that fluorescent lighting fixtures extending approximately 4½ in. below the finished ceiling, together with the maze of sprinkler heads and a multiplicity of columns, made the arrangement of the diffusers extremely difficult. The selection of the correct diffuser was, therefore, an important consideration.

5 **SELECTION OF THE DIFFUSERS** was important because of the congestion of lighting fixtures, sprinklers and columns

How the System is Controlled

The temperature control system for the main supply is as follows:

Winter Cycle. When the supply fan is started, the minimum outside air damper opens wide. A remote bulb temperature controller, on the leaving side of the fan, positions in sequence the normally open preheat steam control valves and the auxiliary outside air and return air damper. Low limit discharge controllers, on the leaving side of the preheat coils, guarantee a minimum discharge temperature of 50 F. The temperature of the air leaving the fan is maintained at approximately 60 F. A room thermostat in each of the five zones positions a normally closed modulating steam valve on the reheat coil. On fan shutdown, preheat valves are normally open, reheat valves normally closed. The nine room thermostats controlling dampers of the high velocity units are not operated during the heating cycle.

Summer Cycle. When the supply fan is started, the minimum outside air damper opens. The maximum outside air damper remains closed, and the maximum return air dampers remain open during the cooling cycle. A pressure control device on the chilled water supply line automatically changes the system from summer to winter operation and vice versa. In summer, a remote bulb temperature controller on the leaving side of the fan, set at approximately 53 F, controls the three-way chilled water valve. The five zone thermostats control the normally closed reheat valves, if it is necessary to maintain the room temperature. In each of the nine areas equipped with high velocity units with automatic volume control, the single temperature pneumatic thermostat positions the volume control damper from the wide open to a minimum stop position, if the room temperature drops below the desired temperature.

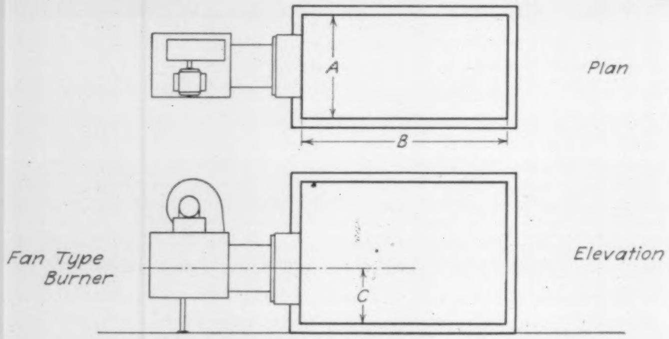
When the three way valve is brought to a closed position by the discharge thermostat, a relay starts opening the maximum outdoor air damper and closing the return air dampers. This enables the air conditioning system to use 100 percent outdoor air when the air temperature is adequate for cooling the space.

The new system fulfills all requirements of up-to-date air conditioning in existing office buildings. It conserves space, it has high quality performance, and it has low maintenance cost.

The system was designed and installed by the J. M. Fink Co., Inc., New York, while the author was employed there as chief engineer.

Successful Boiler Conversion To Gas-Oil Firing

. . . depends on careful selection of the burner and preparation of the boiler. Here's how good performance can be achieved



Size of burner in MBtu and/or gph (140,000 Btu/gal oil)	Minimum width of chamber, in. (A)	Minimum height nozzle centerline to chamber floor, in. (C)	Minimum length of chamber, in. (B)
400— 3.0	16	8	24
500— 4.0	16	8	26
700— 5.0	16	8	28
800— 6.0	24	12	32
1000— 7.0	24	12	36
1250— 9.0	24	12	40
1500—10.5	24	12	42
1600—11.0	24	12	44
1700—12.0	24	12	46
1800—13.0	26	12	48
2000—14.0	28	12	50
2250—15.3	30	12	52
2400—16.6	32	12	56
3000—22	36	14	60

Bridge walls and checker works have been used successfully on many jobs, but no rule can be established on their placement. Trial and error dictate use, depending on individual conditions on each job. Check your utility for any restrictions on the use of bridge walls *before* installing.

1 PRIMARY COMBUSTION CHAMBER size should be no less than the above recommended minimums, says the author. Allow total combustion space content of 30,000 to 70,000 Btu per cu ft. For longer life of chamber, the lower figures should be used

WITH the continued expansion of natural gas distribution and the increased application of boilers to automatic heating and process operations, many installations of gas-oil firing have been completed and more are being considered.

Since normal boiler life under favorable conditions is from 20 to 40 years, and since these boilers represent considerable capital investments, the conversion of units installed before 1941 is desirable from the users' viewpoint.

How Burner Should Be Chosen

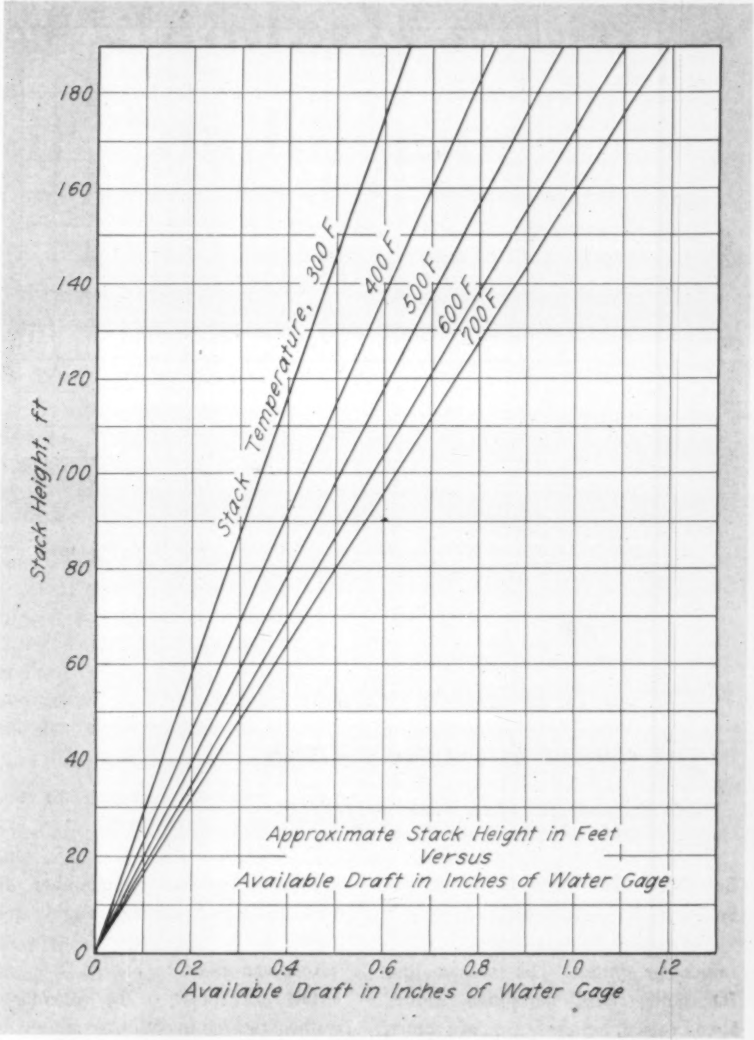
The selection of a burner for conversion purposes is very important, the basic reason being that the conversion must be justified from the standpoint of fuel cost.

The first consideration, then, in the selection of a combination gas-oil burner should be its ability to burn both fuels with good efficiency. The combustion air pressures should be held at 6 in. WG or less, because of noise factors. The burner should be able to utilize the gas fuel at minimum inlet pressures of not more than 6 in. WG. The initial cost of the equipment should be relatively low. This, of course, means that some of the features, such as modulation of fuel input, should be held to a minimum to keep the installation simple and the original cost low.

Gas pilots on the burner that are of the blast type offer stability and

By Robert Pixler

Eclipse Fuel Engineering Co.



2 AMOUNT OF DRAFT that can be expected from a stack of reasonable efficiency can be estimated from these curves

trouble-free operation, in my opinion. I believe the combustion block, or opening through which the burner fires into the combustion chamber of the boiler, should be furnished as a component part of the burner, since many application problems have stemmed from the trial and error method of fabricating this very important part of the combustion system in the field.

Flame failure controls of the electronic type offer a response timing of two to four seconds. Provision should be made for air pressure failure, since 100 percent of the combustion air should be furnished by the burner blower.

In my opinion, the oil pump should be a separate unit and individually powered, being switched out of the circuit and out of operation during the gas firing cycle. Changing from one fuel to the other should be done by switching action alone, either manually or automatically.

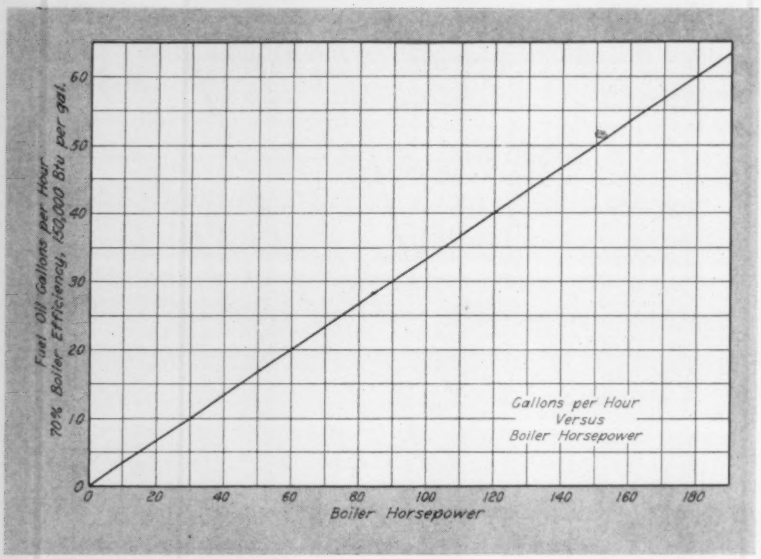
Except on the process installations larger than 100 hp and operating on a dump load or offpeak basis, light oils are often used for standby. Heating installations in this category are usually interruptible loads and must be switched over to standby instantaneously by automatic outside thermostat, or manually.

Heavy oils must be preheated and it is practically impossible to have this kind of change-over instantly available in the sizes we are discussing. Also, since most heavy oil deliveries are on the basis of no less than 5000 gal, heavy oil often loses its economy. Maintenance and operating cost of a heavy oil system may be relatively expensive, without considering the equipment investment when the customer is converting fuel systems.

On larger installations of the dump load variety, where gas is used continually for six to eight months and then a complete switch-over is made to constant operation on oil for four to six months, heavy oil may be considered. However, even then individual consideration should be given to the user's facilities in order to operate successfully on heavy oils.

Boiler Installation Survey

Preparation of the boiler for conversion should be given due consideration. In the first place, it must be determined whether or not the boiler will accept the mounting of the burner. In converting most coal installations, especially on the HRT type boiler, it will be found that the boiler bases are fairly close to the floor level. This means that a limited amount of headroom between the



3 BOILER HORSEPOWER can be read quickly from this chart if plotted against the gal per hr. An input of 50,000 Btu is equal to 1 hp

> ***". . . It is more economical to pit under the boiler than to change all the piping."***

floor and the actual base of the boiler itself is available.

Sometimes this requires that the boiler be pitted. The reason that the boiler must be pitted, rather than raised, is because of return water considerations when this is accomplished by gravity. Also, most boiler rooms have limited headroom, plus the fact that it would be much more economical to pit under the boiler rather than to change all the piping, which would be necessary if the boiler were raised.

The next consideration would be the condition of the firebox setting itself, as to condition of existing brickwork, floor construction, combustion volume, and tightness. There would be no purpose in having an efficient burner and comparatively efficient boiler if there was a leaky combustion chamber setting. Air leaking in would dilute the products of combustion, which would necessarily lower the overall efficiency of the unit.

Typical combustion chamber dimensions which can be roughly followed as a guide on this type of setting are given in Fig. 1.

The next point to be considered is the stack connection available to the equipment. A unit furnishing all its combustion air by forced draft usually is designed to operate against a back pressure of at least 0.10 in. WG. However, it is logical that wherever a suitable draft of 0.02 in. to 0.04 in. WG minimum can be maintained, better results will be achieved. In all cases, a balanced draft type of regulator should be provided, in my opinion. If 0.02 in. to 0.04 in. WG draft is to be regulated on the boiler combustion chamber itself, a draft of 0.06 in. to 0.08 in. WG is desirable on the stack side of the draft regulator.

Fig. 2 gives, for estimating purposes only, the draft that can be expected from a stack of reasonable efficiency. A stack temperature of 500 F to 600 F is considered acceptable on a boiler operating at a pressure of 100 psi.

A figure of 50,000 Btu developed boiler horsepower is used for input sizing. Fig. 3 shows the gal per hr input against boiler hp, using a figure of 150,000 Btu per gal of oil burned.

In converting the input information on a coal fired boiler into developed horsepower, a rule of thumb is that 5½ lb of dry coal equals 13,000 Btu per lb and, assuming an overall of 50 percent efficiency, will develop 1 boiler hp per hr. Another way of getting at this approximation is to allow 5¼ developed boiler hp for every sq ft of grate surface. This is under atmospheric conditions and assuming a reasonable draft on the firebox of not more than 0.10 in. WG.

Multiple Burner Application

Packaged burner units permit great flexibility. Because each burner assembly is a complete system in itself, it is possible to convert boilers of much larger capacities than was believed possible, by the use of multiple burner installations. The burners may be arranged so that the total input is used to bring the boiler up to pressure, at which time the burners both cut off. Upon a falling pressure, or the occurrence of a load on the boiler, the steam pressure starts one burner to operate, and if this is not enough to maintain pressure, the second burner is started. In case of any malfunction, the burners, being completely independent units, can be operated separately. Therefore, the operator is never penalized by more than 50 percent of its total input. As many as three burners per boiler have been applied in this manner with success.

On the basis of an automatic fuel conversion, taking into account some of the things discussed here, it is possible to attain overall efficiencies of 65 percent on the low side and to 80 percent on the high side.

An article by the author on the various types of boilers and their prospects for conversion appeared in the February HPAC.

How Office Buildings Profit with Air Conditioning

Not extra expense but increased profit results from air conditioning an office building. Here's how owning and operating costs are offset by extra income

By Lewis Smith
Heating Engineer

NO LONGER a luxury, air conditioning is an integral part of practically every new office building erected since the war. For when the advantages aside from cooling are considered, they are found to be mainly economic and financial.

Tenant Option Solves Dilemma

An office building could be erected without a complete central air conditioning system if means were provided for the installation, at the tenant's option, of self contained heating and cooling units in the space to be occupied by him at, of course, a proper increase in rent. This idea would be especially applicable in cities where buildings would be rented to many small tenants instead of a few large ones as is the case in New York City.

Thus in those locations having few days needing cooling or dehumidification, an office building of medium size, having no interior spaces, could offer accommodations with and without air conditioning. These self contained units are now readily available and can be recessed into the walls without interference with the windows. Proper openings would have to be left in the construction for the air openings. The initial cost of a central system, which for the small building may be quite high, can be substantially reduced, and to quite an extent can be permanently deferred because there will always be some tenants who are more interested in dollars than in the added efficiency for not too many days each year. There is the further saving for the landlord because the more expensive labor required for operating a central plant can be eliminated.

Cost to Own and Operate

An air conditioning system naturally adds to the cost mainly because it adds something new — cooling. Too often, the figures used also include the cost of heating, but that would have to be paid for in any event. While a fairly large volume of outdoor air is brought in, infiltration is practically eliminated except at night; so, the cost of heating is much the same as before. Cooling is carried on for more hours than the outdoor temperature or humidity seem to call for. An investigation by the New York steam utility of eight office buildings using their steam service for either turbine driven compressors or absorption refrigeration shows for 1953:

1) On the average, the air conditioning plant was first started on April 13 and turned off on November 21, but one building ran from January 14 to December 28. This is all due, no doubt, to the need for cooling interior spaces and those affected by the sun.

2) All these buildings used air conditioning for full office hours during July, August and September of 1953, about 85 percent of this time in June, and 50 to 60 percent in May and October.

3) Six of these buildings have reheaters and used them whenever the air conditioning was used.

How much this all adds in dollars and how much is really chargeable to air conditioning is much discussed. There are two costs involved.

How To Figure Owning Costs

First there is the owning cost. A lot of machinery is involved. This is subject to charges for amortization, interest, taxes and insurance. A life of 15 years is commonly used and this makes the rate 6-2/3 percent per year. Interest at 4 percent, and insurance and taxes at about 3-1/3 percent make a total of 14 percent. This should be applied to the extra cost of an air conditioning system above the heating system, which is a basic cost of the building; that is, to about 84 percent of the total added cost of air conditioning. The net owning charge would, therefore, run about 12 percent, although different accounting methods will produce quite different results.

In any event, these owning costs usually exceed the operating cost and commonly amount to from $0.20 to $0.40 per sq ft of rentable area. Very often, building managers, when asked about the cost of air conditioning, do not include the owning cost.

Actual Costs of Operating Plant

Second, there are the actual costs of running the plant, such as electric power. There is usually only one master meter for all services, and it would be hard to say, except by estimating, how much extra power the air conditioning system is using, unless the circuits are completely isolated and separately metered. Aside from the compressor, there are numerous circulating pumps and motor driven fans, and in many cases a multitude of motor driven fans along the exterior walls. It is difficult to break down the labor cost. Repair costs can be isolated, but not many building owners carry their accounting to the fine point to be able to say just what an air conditioning system actually costs.

In New York City, the figure of $0.15 per sq ft of rentable area is used by one of the largest management companies, based on their experience with a group of post-war air conditioned buildings. Some of these have perimeter heating and cooling units with motors and filters, and it is admitted that the cost of cleaning these filters has not been determined, so that this $0.15 cost may be increased. The manager of one of the earlier large air conditioned buildings who keeps accurate records says the cost is $0.25.

A third case is that of a very large office building wholly occupied by the owner and the manager uses a figure of $0.13, based on accurate accounting. It is safe to take $0.20 as a fair figure, but this would be subject to wide variations. There is, for instance, no uniformity in the method of calculating rentable area, and variations could be 10 percent.

The total owning and operating cost will, therefore, come to about $0.50 per sq ft of rentable area as an average.

How Much Extra Charge?

What about the extra charge for air conditioned space?

Here again the picture is somewhat confused, because there is a lack of specific data, but what it all boils down to is this.

Commercial office buildings of any size are usually put up with the expectation of securing a sufficient number of "big name" tenants to assure the success of the building. These leases are not arrived at by figuring an exact price per square foot and comparing this with other or older buildings but by negotiation for, maybe, a whole floor laid out and equipped to suit the tenant. The cost of operating the building having been set up in advance, the total rentals resulting from such negotiations must naturally be sufficient to cover these costs and yield a profit to the landlord. The prospective tenant decides whether the price is satisfactory for the complete facilities provided, not necessarily for the exact number of square feet involved.

Just how much more he is actually paying per square foot, or how much he would be willing to pay, cannot be definitely stated. However, some authorities do put this figure at $0.50 per sq ft but other equally good authorities say it is as high as $1.00.

On the other hand, there have been cases where a large tenant moving from an older building into a new air conditioned one has actually paid less per square foot. Any premium would include features other than air conditioning, such as would be found in any new building.

Whatever the actual premium is for air conditioned space in a new office building, a little arithmetic shows that the tenant is pretty sure to profit by it. Let's take a premium of $0.75. It is customary, and in some cities compulsory, to allow at least 100 sq ft floor space per average occupant. At $0.75, the tenant is paying $75 per year extra. In a non-air conditioned building, how many hours per year are lost by employees — and the boss as well — by over staying the lunch hour in a cool restaurant? Or taking extra time off for a snack in a cooled lunch room? Or going home early a few bad days? Or just sitting around griping about the heat and humidity? At the present rate of pay, it takes very few hours to wipe out that premium. So, the other benefits such as cleanliness, quietness, lower humidity, etc. are all "velvet."

The landlord has a benefit too. Because of the cleanliness of the air, much less redecoration is needed. Night cleaning can be done faster because of the small amount of dust with closed windows, and that can mean a reduction in the force employed. Ample studies have been made to prove these points, and it is well accepted that air conditioning promotes not only comfort but efficiency for both tenant and landlord.

An article by the author on the greater operating efficiencies and savings obtained by air conditioning interior spaces appeared in the February HPAC.

Air Conditioning Preserves Art Collection

ONE OF THE nation's great art collections is now being preserved and protected by air conditioning. Two 25 ton water chillers have been installed as the heart of the air conditioning system in O'Shaughnessy Hall of Liberal and Fine Arts at the University of Notre Dame, South Bend, Ind., according to Servel, Inc. They are operated by steam.

The water chillers provide the temperature and humidity control necessary to preserve the priceless art treasures in five galleries and in the storage room. Zone control is employed throughout the conditioned area.

The collection, valued in excess of $1,500,000, includes 355 paintings. Among them are several fine examples of 15th and 16th century Christian art, including many old Italian masters. Flemish, German, English, Spanish and American artists are also represented.

Since the dedication of O'Shaughnessy Hall in May, 1953, the galleries have become a center for revived student interest in fine arts, and also a mecca for art lovers.

What We Need Is an Efficiency Rating

. . . for evaluating the thermal qualities of any building says F. W. Hutchinson, Professor of Mechanical Engineering at the University of California

• The time has come, says the author, for a basic standard which the architect, the engineer and the building owner can use in determining the thermal adequacy of any structure and in comparing it with others. An equation is proposed which integrates the various thermal factors in any structure to give a single number, between 1.0 and 10, the Heating Economy Factor. A Cooling Economy Factor is also obtained.

THREE major variables affect the size and adequacy of either a heating or an air conditioning system: (1) the size of the structure, (2) its geographical location and (3) the thermal characteristics of the structural materials in the building. Curiously, all of the determining characteristics are related to the structure rather than to the heating or cooling system. Yet the attention of engineers, heating contractors and architects is usually directed toward the quality of the mechanical equipment rather than to the thermal quality of the structure.

Many standards exist within the heating and the air conditioning industry, but in the region between the engineer and the architect there seemingly is no adequate overall standard. This is the region where the greatest thermal waste occurs.

Too often, architectural plans call for a structure which will be unbearably hot in summer and will either be cold in winter or will have high heat requirements. Too often, also, the engineer receiving such plans, and recognizing the defects, will often limit his interest and responsibility to specifying adequate heating or cooling for the inadequate structure.

Both architect and engineer often shirk their respective professional responsibilities and perpetrate thermal "monsters," which drain the owners through excessive operating costs.

A Proposed Solution

To the average layman, an adequate heating or cooling system is one that maintains comfortable conditions. He dislikes high operating costs but usually accepts them as unavoidable. Needed, therefore, is a simple criterion — some basic standard — which the architect, the engineer and the owner can use directly in determining the thermal adequacy of any structure and in comparing it with others. It seems that an integration of the different thermal conditions in any one structure to give a single number which can be used to compare that structure thermally with others would fill this requirement. The structure may differ in size or location and it may still be evaluated by this method.

Having such a standard, one could note that a well insulated building with large areas of single glass might not be better, thermally, than an uninsulated building with reduced glass area. In short, the "standard" would refer to overall thermal performance rather than to details of insulation, glass area and such.

Fortunately, a term suitable for such a standard is already in widespread engineering use. In sizing the panels in panel heating systems, it is common to visualize any given room or structure as equivalent to another room or structure in which homogeneous thermal conditions exist throughout. Thus, an actual room with heat losses through thermally different areas such as exterior walls, interior partitions, floors, windows and the ceiling, is visualized as being replaced by a room of equal size in which all of the wall, floor, and ceiling areas are thermally identical, and for which the room heat loss equals the heat loss from the actual room.

In equation form, the situation for heating becomes

$$\begin{aligned} q_s &= U_f A_f\,(\Delta t)_f + U_w A_w\,(\Delta t)_w \\ &\quad + U_c A_c\,(\Delta t)_c + U_i A_i\,(\Delta t)_i \\ &\quad + U_g A_g\,(\Delta t)_g \\ &\quad + 0.018V\,(t_r - t_o) \\ &= q_e = U_e\,(A_f + A_w + A_c \\ &\quad + A_i + A_g)\,(t_r - t_o) \\ &= U_e A_t\,(t_r - t_o) \end{aligned}$$

where U = overall coefficient of heat transfer, Btu per hr per sq ft per F; A = area of respective sections of the structure, sq ft; Δt = air-to-air temperature drop across the surface in question, F; $_{f,w,c,i,g}$ = subscripts denoting, respectively, floor, exterior wall, ceiling, inside partition and glass area; q_s = total heat loss, by transmission and by ventilation, from the actual room, Btu per hr; q_e = total heat loss from the equivalent room, Btu/hr; ($q_a = q_e$); t_r = room air temperature, F; t_o = design outside air temperature, F; A_t = total surface area of room = $2(LH + LW + WH)$ where L, W and H are the length, width, and height of the room; U_e = equivalent overall coefficient of heat transfer, transmission plus ventilation, Btu per hr per sq ft per F; V = infiltration air, cu ft per hr; and 0.018 = a constant numerically equal to the energy, Btu per hr, required to heat 1 cu ft of air per hr through 1 F.

The transmission and ventilation losses from the structure, q_a, must be calculated* before sizing the heating system. Thus, the engineer can determine the equivalent overall coefficient from the equation

$$U_e = q_a/A_t(t_r - t_o)$$

The "Heating Economy Factor"

Inherent in the U_e term defined by the above equation are all the characteristics needed for a thermal standard. Practically, however, U_e has two disadvantages: (1) Its numerical value decreases as the thermal effectiveness increases. (2) Its numerical expression is always either as a fraction or as a decimal. Both disadvantages are readily overcome by taking the reciprocal of U_e, the equivalent thermal resistance, and using it as the proposed thermal standard, defined as the "Heating Economy Factor," *HEF*. Thus

$$HEF = A_t\ (t_r - t_o)/q_a$$

The *HEF* for all types of structures will have a numerical value between 1.0 and 10. For an all single glass, dirt floored hothouse, the *HEF* would be slightly greater than unity, whereas for a well insulated windowless structure, the *HEF* would be somewhat less than 10.

Influence of Glass Areas

In some types of construction, unusually large glass areas can be responsible for relatively low values of the *HEF*. To avoid unjustly penalizing the glass for possible thermal deficiencies in other parts of the structure, the suggestion is made that a glass correction factor, G_f, be evaluated for "average" glass in that particular structure. Thus if 15 percent of wall area were considered a fair average, the excess heat loss through windows would be

$$\Delta q_g = [A_g - 0.15\ (A_g + A_w)]\ (U_g - U_w)\ (t_r - t_o)$$

where Δq_g = excess heat loss, Btu per hr, of actual structure as compared with one having 15 percent of total wall area, 0.15 $(A_g + A_w)$, as window A_g, A_w = glass and wall area of the *actual* structure.

By subtracting this *excess* loss from the calculated actual loss, q_a, a term q_g is obtained which is equal to the total heat loss that would exist if 15 percent of the structure's wall area were glass. The HEF_g of this 15 percent structure is

$$HEF_g = A_t\ (t_r - t_o)/(q_a - \Delta q_g)$$

and the glass correction factor, G_f, is then

$$G_f = HEF_g - HEF$$

The larger G_f becomes, the greater is the penalty attributable to large window area.

Thus, the glass correction factor permits translating the heating economy factor of the actual building to an equivalent value for the so-called standard building. If *HEF* and G_f appeared as two numbers on every set of plans, they would immediately inform the architect, engineer, builder and owner as to the thermal quality of the structure.

The "Cooling Economy Factor"

By analogy with the *HEF*, a cooling factor can be readily obtained from the equation

$$CEF = [A_t\ (t_r - t_o)]/(q_a + q_g')$$

where all terms except q'_g are as previously defined. The q'_g term includes all heat gains from causes other than direct transmission or infiltration. Under normal conditions q'_g would be equal to the sum of the design loads for occupants, lighting, internally-housed power equipment and the solar effect.

Among any group of engineers who evaluate solar heat gain by a given method, the calculated *CEF* will provide as accurate and dependable a thermal standard for summer as does the *HEF* for winter. Unfortunately, however, considerable diversity of opinion still exists as to the preferred method of evaluating solar load. Not until this situation has been resolved will it be possible to make nationwide *CEF* comparisons with the accuracy that is now possible for *HEF* comparisons.

Limitations of the *HEF*

Note that the *HEF* refers specifically and wholly to the structure, which is the building, rather than to the indoor environment. Indoor comfort and heating costs depend not only on the thermal effectiveness of the structure — the *HEF* — but also on the type of heating system, its size and combustion efficiency, and on the effectiveness of distribution of heating effect throughout the occupied space.

The first of these three factors is quantitatively evaluated by the *HEF*, the second by the rating of the heating equipment, and the third by the comfort of the occupants.

The *HEF* is solely a criterion of the thermal adequacy of the structure. It is neither a clue to, nor a panacea for, inefficient, ineffective or inadequate heating systems.

Optimum Values of the *HEF*

Variations in the *HEF*, regardless of geographical location, are always indicative of differences in the thermal effectiveness of the structures which are being compared. If the *HEF* of one structure is 2.0 and that of another is 3.0, the second structure will have a 33 percent less loss per unit total area and per degree temperature difference. In absolute terms, however, the actual heat loss — thus the heating cost — is a function of outside minimum temperature. Hence, there is greater economic justification for use of added insulation in Maine than in Florida. This would mean that optimum regional values of the *HEF* would be established, and comparisons of actual values with optimum values would be on a regional basis. The purpose of the *HEF* is not to make added insulation seem desirable in localities where it is not economically feasible, but to assist the buyer in recognizing the heating economy of the type of construction he is paying for.

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*In order for variations in a thermal standard to accurately reflect variations in thermal effectiveness, it is essential that heat loss calculations be made by a uniform method. It is here recommended that such calculations be made according to the procedure outlined in the "Guide" of the American Society of Heating and Air-Conditioning Engineers.

Further Significance of *HEF*

Although the reason for proposing adoption of the heating economy factor as a standard is based essentially on the possible economic advantage to the owner, other technical considerations make *HEF* a term of considerable added usefulness to the engineer and to the heating equipment manufacturer. Thus, when a heating system is tested in a particular structure, the performance of the system will depend on the load and on the thermal characteristics of the structure. The *HEF* of the structure, if known, can be used with the known outside air temperature to extrapolate the test results to other thermally similar structures.

Similarly, knowledge of *HEF* permits direct and simple approximate calculation of the average inside surface temperatures of the room by the equation

$$t_s = t_r - [0.606\ (t_r - t_o)]/(HEF)$$

where all terms are as previously defined except that t_s is the average inside surface temperature of the enclosure for which *HEF* applies. Note that t_s closely approximates the mean radiant temperature. Hence, knowing t_s permits direct determination of the inside air temperature for optimum comfort. Since experience dictates that the inside air temperature should be raised 1 F above the usual setting of 70 or 72 F for each degree that t_s is below the base setting, knowledge of *HEF* provides a simple means of determining the approximate upward adjustment required to offset the effect of large single pane glass areas or other "cold wall" characteristics.

When such a standard as the Heating Economy Factor is adopted, it will serve as a constant reminder to the architect, the engineer and the owner of the suitability, thermally speaking, of any proposed structure.

QUESTION OF THE MONTH

What Maintenance Program for Valves?

The Question, *What's the Basis of a Maintenance Program for Pressure Reducing Valves?*, was published previously in HPAC and is repeated here for information. Some answers were published last month. Here are some others that have been received. Other comments for publication will also be welcome.

"I am looking for information which might furnish a basis for an inspection, overhaul and replacement program covering 30 1 in. pipe size, pressure reducing valves, diaphragm operated, on cold water service. I would like to know how often to open the valves for inspection and about how often, on the average, it would be necessary to replace the diaphragms and the other working parts of the valves."

K. E. LANKTON —

"Valve Maintenance Depends Upon the Use"

As far as our experience on this is concerned, we have found that some organizations inspect their control equipment every year, others have set up a program for an inspection every two years. There are still others, however, who maintain a replacement stock and will let the item operate until some difficulty occurs and then in a matter of minutes a replacement can be made. In the meantime, the valve which was removed can be completely overhauled for the next replacement requirement that may arise.

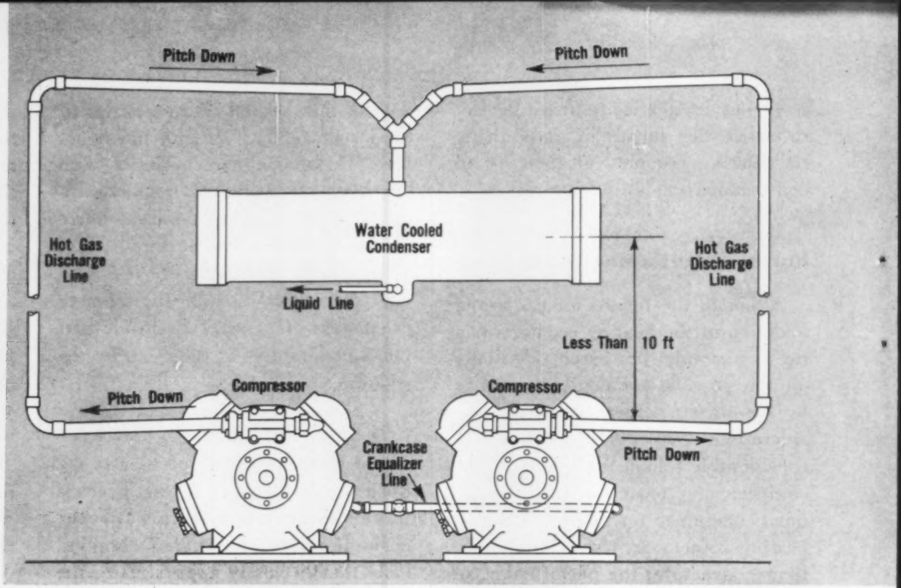
The reason this question is somewhat difficult to answer with specific information is that some of our valves have been in service without replacement of any parts for periods from 5 to 15 years, whereas others under severe service conditions had to be overhauled and checked within a much shorter time. Therefore, the decision as to when or how often an overhaul program should take place would be dependent upon the organization, the service and the type of control equipment that is being used. — K. E. Lankton, Vice President, O. C. Keckley Co.

READER ASKS —

"How To Group Air Compressors?"

"We would like to obtain information which would help us reach a decision regarding the practicability of grouping air compressors to serve two large industrial plants at one site. At present we have four 2000 cfm, two 1000 cfm and one 750 cfm air compressors in one plant. In the other plant we have three 1000 cfm and one 2000 cfm air compressors.

"We would like to have a suggested method of grouping all of these air compressors and their auxiliaries, such as the coolers and receivers, and the proper method of designing the piping for this grouping."—K.F.J.



1 WITH CONDENSER LESS than 10 ft above compressors, oil drainback is prevented by "Y" connection above

PIPING CONNECTIONS for compressors

Better Refrigerant Piping for Parallel Compressor Systems

1. with water cooled condenser

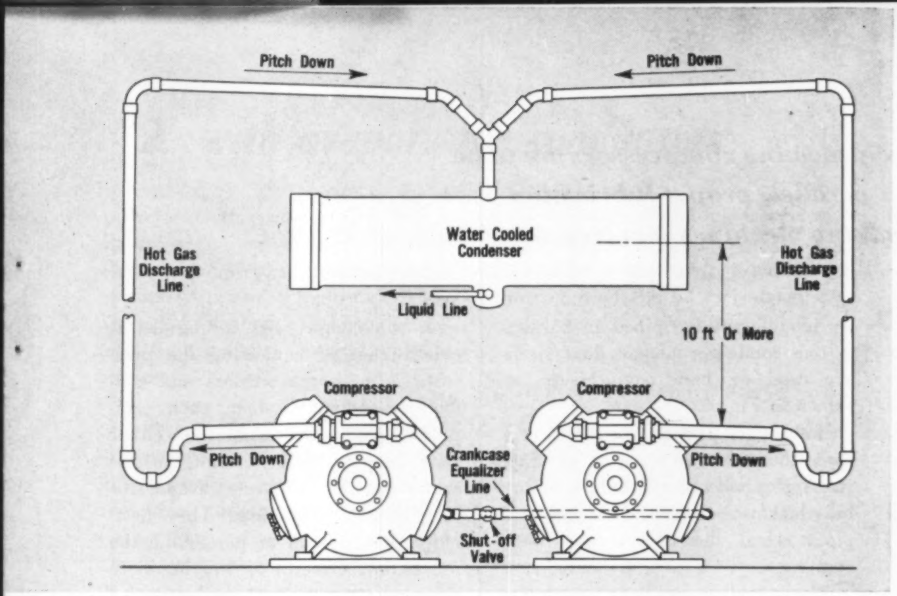
By Lincoln R. Scafe
Manager, Service Dept.,
The Trane Co.

THE MAIN TROUBLE in using a single condenser above two compressors in parallel is getting oil up to the condenser. The gas velocity in the vertical risers must be at least 1500 fpm to carry along the oil.

If a single common riser is used, the line will have to be sized to provide a minimum velocity of 1500 fpm when only one compressor is running. However, when both compressors are operating simultaneously and at full capacity, the pressure drop will be high. Therefore, instead of a common riser, separate discharge mains for each compressor are recommended. For a better understanding of the problems, let's look at several systems.

When the condenser is mounted *less* than 10 ft above parallel compressors without capacity modulation, the piping is arranged as shown in Fig. 1. The "Y" connection above the condenser prevents gas pulsations from colliding violently as they enter the single line. At the same time, the "Y" forms an oil trap that prevents oil from draining back into the idle compressor when only one compressor is running.

When the condenser is mounted *more* than 10 ft above parallel compressors without capacity modulation, there is an additional oil problem. Gas-entrained oil clings to the walls of long vertical discharge risers. When one or both of the compressors shut down, oil drains back toward the compressors. This can cause serious damage to the compressors when they start up. To prevent it, oil


Pitch Down
Pitch Down
Hot Gas Discharge Line
Water Cooled Condenser
Hot Gas Discharge Line
Liquid Line
10 ft Or More
Compressor
Compressor
Pitch Down
Crankcase Equalizer Line
Pitch Down
Shut-off Valve

2 WITH CONDENSER MORE than 10 ft above compressors, oil drainback is prevented by traps at the bottoms of risers

without capacity modulation:

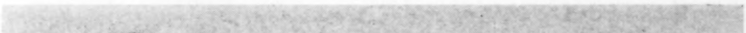
- ***How to arrange compressors in parallel***
- ***How to avoid lubrication failures***
- ***How capacity modulation affects piping arrangement***

traps or collectors are installed where the horizontal discharge pipes turn into the risers, as shown in Fig. 2.

With Capacity Modulation

If the compressor has capacity modulation, a vertical hot gas discharge line sized for 1500 fpm at minimum load has an excessive pressure drop at maximum load. To overcome this, a double riser system, as shown in Fig. 3, should be used. The smaller riser is sized for 1500 fpm gas velocity at minimum load. The larger one is sized so that the velocity through both risers will not be less than 1400 fpm at maximum load.

When the system operates at reduced capacity, the oil collects in the trap at the bottom of the larger riser and seals it. All of the gas then travels up at high velocity through the smaller riser. When the system operates at maximum load, the seal


Size Small Riser for 1500 fpm at Minimum Load
Pitch Down
Compressor
Hot Gas Discharge Line

3 DUAL RISERS on compressor with capacity modulation maintain gas flow at not less than 1500 fpm. At reduced capacity, trap seals off larger riser

. . . If two or more reciprocating compressors are to be operated successfully in parallel, proper lubrication must be maintained in all the machines involved.

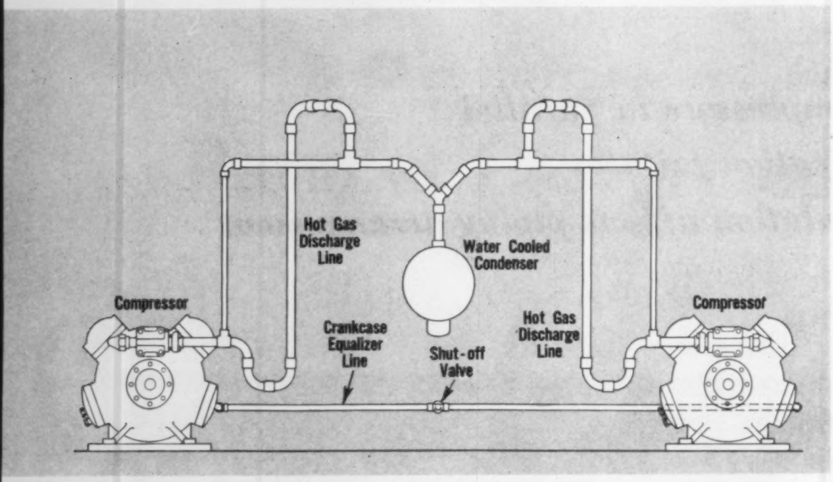
breaks and the gas goes up through both risers at the desired velocity. The oil trap should be as short horizontally as possible, to prevent trapping too much oil.

The inverted trap at the top of the larger riser prevents oil drainback from the horizontal line down the larger vertical line when the latter is sealed.

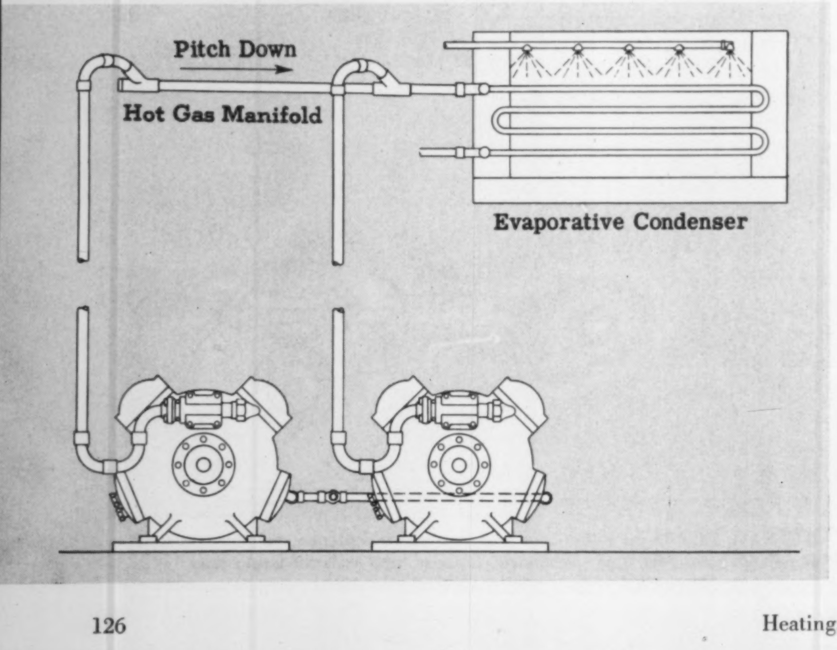
When two compressors with capacity modulation are piped in parallel to one condenser above, dual risers are used on both compressors, as shown in Fig. 4.

Besides its primary function as a seal, the oil trap section of dual risers also collects, on shutdown, any oil which was clinging to the vertical pipes when the compressors were running.

The problem of two condensers with two compressors in parallel is chiefly that of equalizing the pressures in both compressors and condensers. Actually, when each compressor has its own condenser, either separate refrigerant circuits in the evaporator or separate evaporator coils should be provided. This eliminates the problem of paralleling the refrigerant circuits of two or more compressors.


Hot Gas Discharge Line
Water Cooled Condenser
Compressor
Crankcase Equalizer Line
Shut-off Valve
Hot Gas Discharge Line
Compressor

4 EACH COMPRESSOR has dual risers in a system of parallel compressors with capacity modulation


Pitch Down
Hot Gas Manifold
Evaporative Condenser

5 USING AN EVAPORATIVE CONDENSER, two parallel compressors have separate risers that join common header

2. with evaporative condensers

Even though economy may dictate the use of one evaporative condenser with two compressors, it is not always necessary to parallel the compressors. The coil in the condenser can be split into two circuits to provide separate refrigerant circuits for both compressors.

Separate risers for each compressor are recommended. Risers should join into a common header and feed directly into the evaporative condenser. Connections between the risers and the common header should be made from the top, as shown in Fig. 5, so that oil cannot drain back.

If the evaporative condenser is well over 10 ft above the compressors, each riser should have an oil trap to prevent oil from draining back into the compressors during the off cycle. Should the compressors be equipped with capacity modulation, and if no oil separators are provided, dual risers should be arranged from each compressor. If oil separators are used, dual risers are not necessary, since most of the oil is trapped out on leaving the compressors.

Installing Oil Separators

When oil separators are used, they should be installed in each discharge line as close to the compressor as possible. Under no circumstances should they be placed in the vertical riser. Oil collected in the separator is best returned to the compressor through a small copper line to the suction line, or the suction chamber of the compressor, if it has one. The oil should not be returned directly into the crankcase. The trapped oil usually carries some liquid refrigerant, which will flash into gas upon entering the low pressure area. If it is returned to the crankcase, flashing will cause foaming of the oil, thereby upsetting the equalizer system between the two compressors.

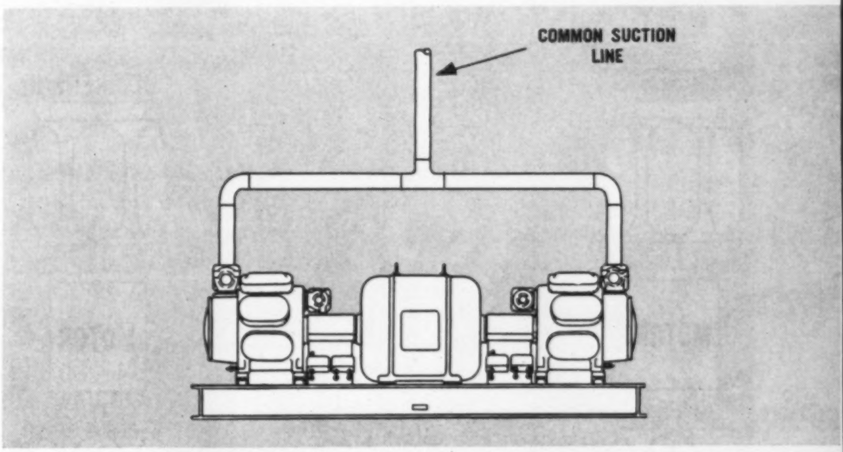
Still another danger may cause lubrication failure. If the float valve in the oil separator ever fails in the open position, hot gas will blow directly into the crankcase, with disastrous results. It may blow the oil away from the inlet to the oil pump, causing lubrication failure quickly. It will also build up a super pressure in the crankcase that will prevent normal oil return from the system to the compressor.

With compressors that pump little oil, oil separators may not be necessary. However, separators are useful on long vertical risers, regardless of the amount of oil pumped. Although oil separators are not necessarily 100 percent efficient, they reduce the amount of oil which must be lifted through vertical risers.

3. duplex compressor units

A "duplex" unit consists of two compressors mounted on a common base and driven by one motor. When the motor operates, both compressors run. Thus, where suction piping is concerned, a duplex unit must always be considered as a single compressor unit, even when each compressor has capacity modulation and when the steps of capacity modulation are staggered or overlapped.

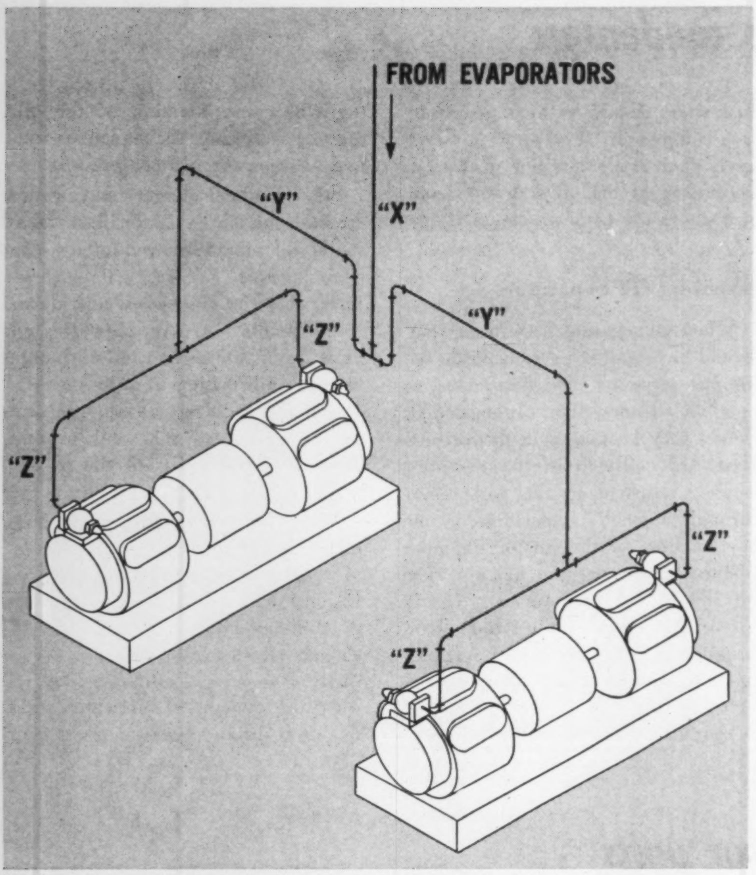
The suction connections to the compressors of a duplex unit should, therefore, come from a common suction line, as shown in Fig. 6. If multiple evaporators are connected to a duplex unit, all evaporators must be connected to a common suction line.



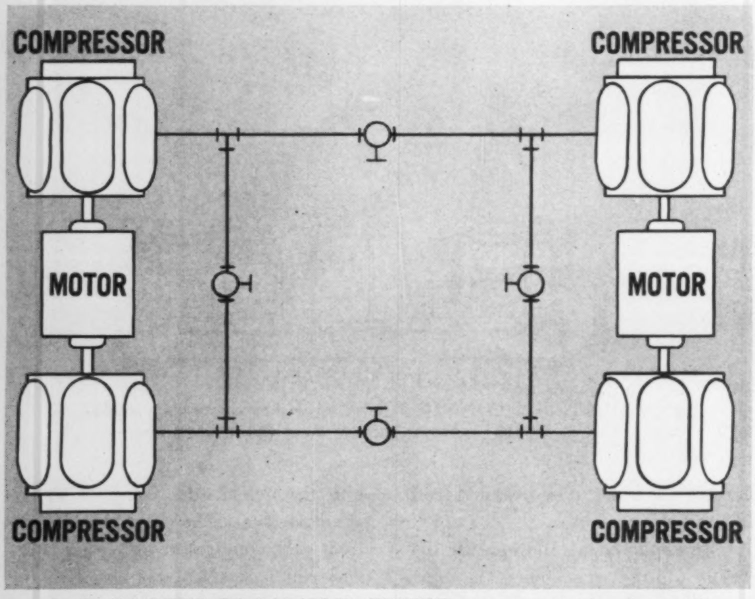
6 SUCTION PIPE CONNECTIONS to a duplex compressor should come from a single common suction line from all evaporators

The discharge piping from a duplex compressor unit naturally must be properly sized and arranged to maintain an adequate refrigerant gas velocity for getting oil up to the condenser. If the compressors have no capacity modulation, a single common hot gas line can be installed from the unit.

With capacity modulation, the discharge piping arrangement is somewhat more complicated, since the discharge velocity must be above 1500 fpm throughout the complete range of capacities. The best way is to treat each compressor as a single unit and run a separate hot gas line, or lines, from each compressor to the condenser.



7 WITH DUPLEX COMPRESSORS IN PARALLEL, the single common suction line "X" from evaporators must be properly trapped where it divides into "Y"



8 PLAN VIEW OF PARALLEL DUPLEX compressor units shows oil equalizing connections. Valve stems should be horizontal

Duplex Units in Parallel

In some cases it may be necessary to connect two duplex compressor units in parallel. See Fig. 7. The common single suction line "X" from the evaporators divides into two suction lines, "Y," each of which serves one duplex unit. The suction lines serving each duplex, in turn, separate into two suction lines, "Z," each of which leads to one compressor.

As with individual compressors operating in parallel, duplex units in parallel must have a proper means of trapping the oil in the suction line. The oil trap is installed where the common suction line from the evaporators separates into the two common suction lines serving the duplex units.

If no oil trap is installed, the following can take place. When only one of the duplex units connected in parallel is operating, the inoperative unit tends to collect a considerable amount of oil. The amount can be enough to rob the operating duplex unit of adequate lubrication. Also, valve damage may occur in the inoperative unit when it is started again. A properly designed oil trap returns sufficient oil to the compressors of the duplex unit that is running. The small quantity of oil trapped will easily be entrained when the inoperative duplex unit starts.

Arrangement of Units

Parallel duplex compressors can be arranged in the equipment room in various ways. As far as oil equalizing connections are concerned, it is recommended that the units be placed back-to-back, with the oil equalizing lines interconnected as shown in Fig. 8. The oil equalizing lines must be in the same horizontal plane to give proper crankcase oil level balance and to prevent oil trapping. Also to prevent oil trapping, the interconnecting shutoff valves must be installed with the stems in the horizontal position.

Two previous articles on this subject by the author appeared in the September and October 1954 issues of HPAC.

THE LAW AND YOUR PROFITS

By William Hurd Hillyer

Watch Out for Loose Contracts

HAVING a contract accepted, following your bid on a public project, does not necessarily mean that you can safely proceed with the work. The following case pinpoints one post-acceptance peril. [All names herein are fictitious.]

A county board appropriated in the annual budget $600,000 for a new jail. When the bids were opened, even the lowest bid far exceeded the available amount So all bids were rejected. Each bidder, including a heating and piping contractor, was asked his basic bid and how much that bid would be *reduced* if the county should eliminate certain construction work and substitute certain cheaper materials.

Conversely, each bidder was asked in what amount his basic bid would be *increased* if alternative items of a more expensive sort were substituted or added. Further, the county reserved the right to accept or reject any or all of the alternate proposals *within six months from the date of the award of the contact*, at prices quoted on the proposal form. This stipulation was designed to bring the jail's cost within the appropriation. In other words, the alternative bids would enable the county to go ahead with building part of the jail and to finish it later if funds became available.

New bids were opened, including those for heating and piping. It then transpired that several of the alternative deductions were subtracted by the contractors from the basic bid in order to arrive at contract figures within the available money. These alternative deductions were in turn subtracted from the basic bids by the board, so as to determine the low bidders, whose sum total bid amounted to $583,000. The successful heating and piping bidder was the Torridor-Temprit Co.

Two Taxpayers Sue

A month after the contracts were let, a taxpayer brought suit to have all the contracts declared void, and asked the court to permanently enjoin both county and contractors "from proceeding with the work." Soon another taxpayer intervened with a separate suit.

Under the delayed-action provision the board could, within six months after the award, require successful bidders to complete their deducted alternate items at the quoted price. In fact, the next year's budget was approved, carrying an additional $210,000 jail appropriation. At the same meeting, "apparently to forestall the effect" of taxpayers' suits, the board rejected all the alternative bids, which had been deducted from the successful basic bids.

By this action, the board abandoned all rights or intention to require completion of alternate items by successful bidders, under the six-month provision, ruled the state supreme court. (The trial court had awarded summary judgment against the contractors and they had appealed.) "In short," opined the learned justices, "the board sought to defeat the purpose" of the taxpayers' action by asking for new bids on the alternative items.

The supreme court held that the provision in the request for bids, wherein the board reserved the right to accept or reject any of the bidders' alternate proposals for bid-reduction, invalidated the contracts. Such a provision was seen by the high court as permitting the board to change the agreements materially after letting the contracts, "thereby opening the door to fraud."

In general, the court said: "Whatever method is adopted in letting public contracts" the work cannot "be pursued in an unreasonable, arbitrary or capricious manner contrary to public welfare." In a clear-cut *syllabus*, the court held that, as a matter of sound public policy, a presumably competitive contract "is void, without any showing of actual fraud or intent to commit fraud, if a procedure has been followed which emasculates the safeguards of competitive bidding."

All the contracts were declared void and the Torridor-Temprit Co., along with its fellow contractors, was permanently enjoined from doing work on the jail. A beforehand scrutiny, by competent private counsel, of the papers and methods incident to the board's handling of presumably competitive bids in this instance might have spared all parties considerable loss and embarrassment.

[Note: While this discussion applies to an actual case, it should be remembered that legal rules vary in different states.]

WILLIAM HURD HILLYER, author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. A former vice president of the Atlanta Trust Co., his work there gave him a practical legal background.

1 LOSS OF PRESSURE at the elbow in a round duct system was measured here in tests on 7 in. diameter elbows with a radius ratio of 2½

How Much Pressure Loss

. . . lack of reliable data led to these tests of two types of elbows

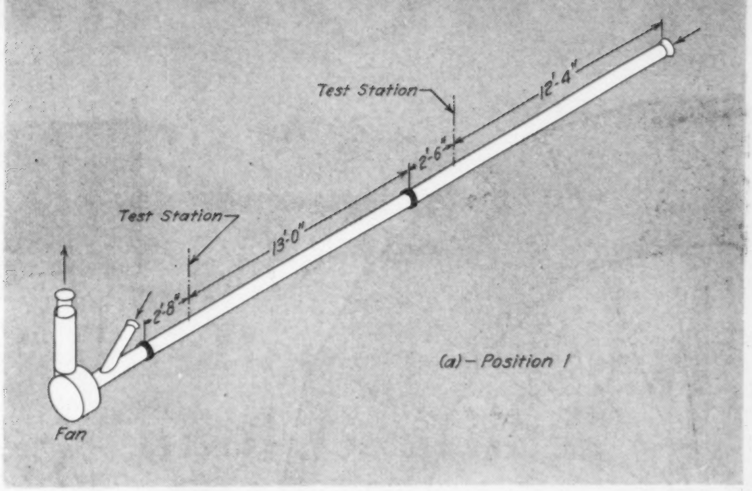
By R. K. Guthrie
Mechanical Engineer
Procter & Gamble Co.

AIR SYSTEMS are used by the Procter and Gamble Co. for dust control in the processing and packaging of granular soap products, in pneumatic conveying, fume venting, cooling and drying.

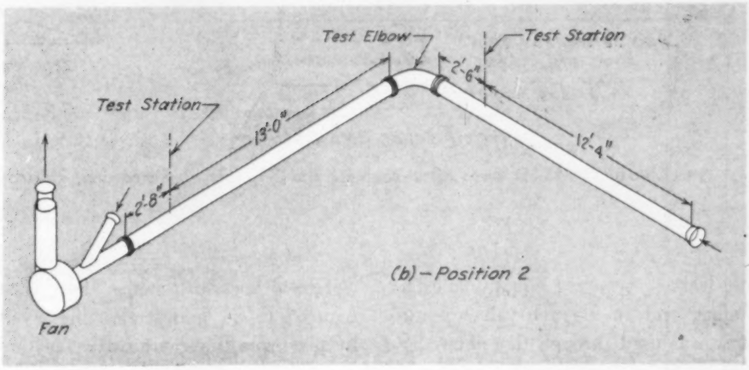
Considerable disagreement exists between investigators over data for pressure loss in round elbows. And frequently system performance does not agree with predictions made from data given in existing literature. This disagreement has been attributed by some to differences in test procedure. Because of this, we decided to conduct some tests ourselves.

The tests were conducted on elbows of only the radius ratio of 2½. Elbows tested were of the riveted and soldered type, one of seven piece and one of nine piece construction. Both elbows were 7 in. in diameter.

The ductwork was set up in the lab so that a preliminary test could be made of the straight duct with the elbow removed. (See Fig. 2a.) Several pitot tube traverses were made with the duct in this position to definitely establish friction loss characteristics of the test duct. Fol-



2a A PRELIMINARY TEST was made of the straight duct with the elbow removed. Friction loss characteristics were determined by pitot tube traverses



2b TEST ELBOW was inserted after calibration of test duct, and the traverses were re-run at the same test points. Turbulence was reduced by a thinplate orifice in the bell mouth inlet

In Round Elbows?

lowing this calibration, the test elbow was inserted — see Fig. 2b — and the traverses were re-run at the same test points.

The two test stations were located as shown in Fig. 2; one, four and one-half diameters ahead of the elbow and another, 22 diameters downstream from the elbow. The elbow was flanged on either end. These flanges were made tight with 1/8 in. gasketing and all joints were soldered to prevent leakage.

For measuring velocity pressure, the standard pitot tube as described in the National Association of Fan Manufacturers' fan test code was used with an inclined draft gage. Static pressures were measured by inserting the pitot tube into the center of the duct, and observations were made on a micromanometer. Special pitot tube guides controlled the orientation in two planes for the eight-point traverses that were made. Wet and dry bulb temperatures were recorded with a standard sling psychrometer.

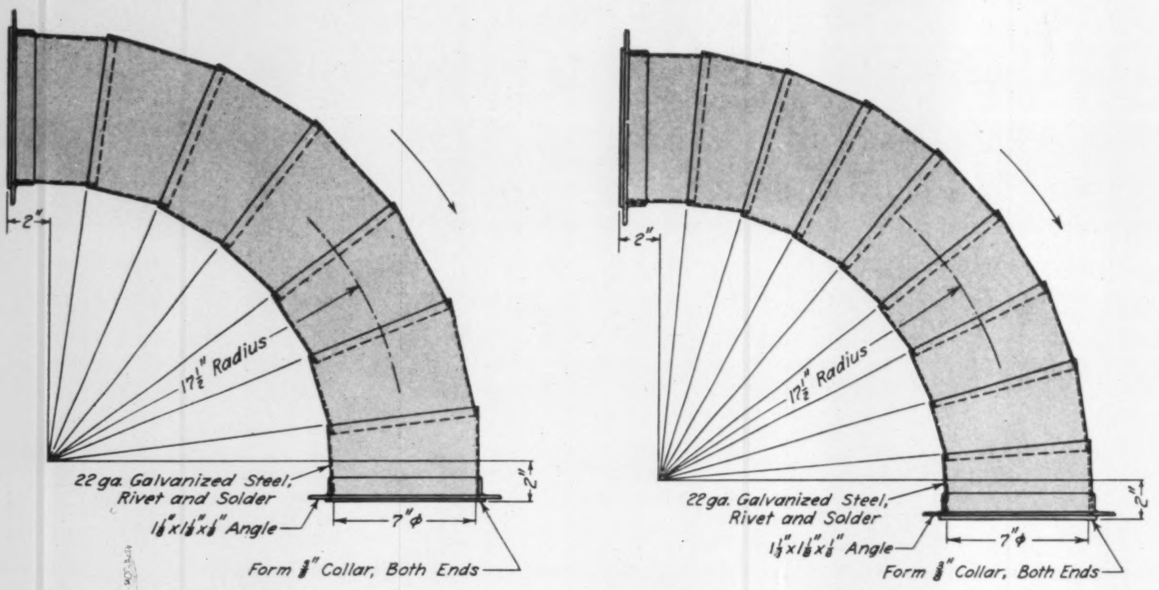
The plotted data is shown in Fig. 4. Data obtained from test station 1, without the elbow in place, is plotted as the straight duct base line.

Here Are the Results

Pressure losses are expressed as a percent of the duct velocity pressure. Some difference of opinion exists as to whether pressure loss should be expressed in this manner, or as an equivalent length of duct. The guide used here is the curve presented by Frank L. Busey[1] and in Fan Engineering[2]. It is felt that pressure losses in an elbow of this radius ratio may be best expressed as a percent of the duct velocity pressure.

To determine the value for friction loss in a straight duct, considerable testing was conducted. It was found that the friction factor for the test duct was lower than that expressed in the ASHAE duct friction chart. Straight duct friction loss data thus obtained was used in correcting the pressure drop data for the difference in location between the test stations and the elbow flanges.

Leakage in the duct system was not a problem because precautions were made by sealing all joints to insure a tight system. Pitot traverses were taken both upstream and downstream of the elbow to check for no leakage. As there were two flanges between the test stations, it was assumed that


2"
17½" Radius
22 ga. Galvanized Steel, Rivet and Solder
1⅛"x1⅛"x⅛" Angle
7"ϕ
2"
Form ⅜" Collar, Both Ends
2"
17½" Radius
22 ga. Galvanized Steel, Rivet and Solder
1⅛"x1⅛"x⅛" Angle
7"ϕ
2"
Form ⅜" Collar, Both Ends

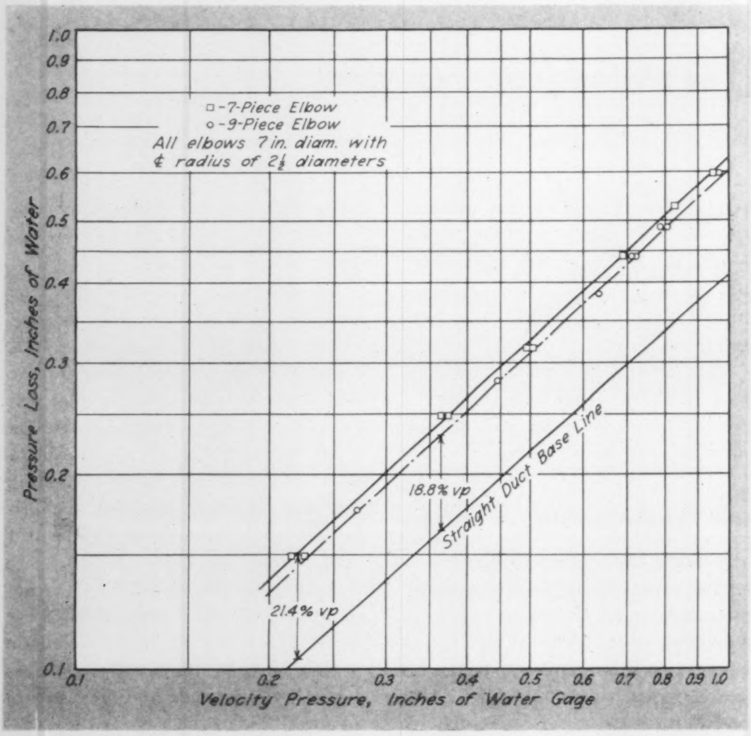
3 ELBOWS TESTED were of seven piece and nine piece construction, riveted and soldered, 22 gage galvanized steel

the leakage occurred equally at each flange, and an average value of air flow was used through the elbow.

Turbulence within the duct was reduced to an unobjectionable level by placing a thin-plate orifice in the bell mouth inlet. The reproduction of readings in check tests was considered satisfactory evidence of good flow for test purposes.

To obtain a value for pressure loss expressed as a percent of duct velocity pressure, the loss in inches of WG in the straight duct was plotted against duct velocity pressure as a base line, and the loss—with the elbow inserted—was also plotted on the graph. The vertical difference between these two lines was then expressed as a percent of the respective velocity pressure. It was found that in the seven piece elbow the average pressure loss over the range tested was 21.4 percent of the velocity pressure. For the nine piece elbow the average pressure loss was 18.8 percent of velocity pressure.

As these values give but a limited picture of elbow losses, it is suggested that further testing be conducted to establish additional pressure loss curves.



4 RESULTS of elbow pressure loss tests averaged 21.4 percent of velocity pressure for the seven piece elbow and 18.8 percent for the nine piece elbow

References

1. "Loss of Pressure Due to Elbows in the Transmission of Air Through Pipes or Ducts," by Frank L. Busey, ASHAE Transactions, 1913, pp. 366-376.

2. *Fan Engineering*, by Richard D. Madison, Buffalo Forge Co.

SAM LEWIS SAYS

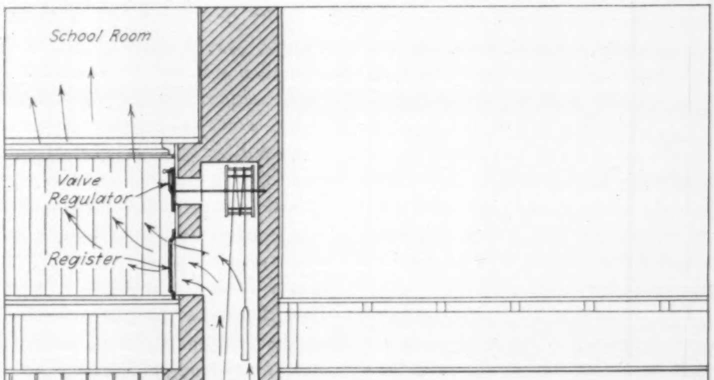
"Since 1908 I've Been Designing Toledo's School Heating"

About 1908 I was called to Toledo, where a movement had been started toward reconstruction of the heating plants in six ancient brick primary school buildings. All of them had been heated for many years by cast iron warm air furnaces with gravity or thermal ventilating systems, which probably represented a good choice of equipment at that time. The gravity furnace systems had no fans, and indeed there was usually no daytime electric power to operate fans.

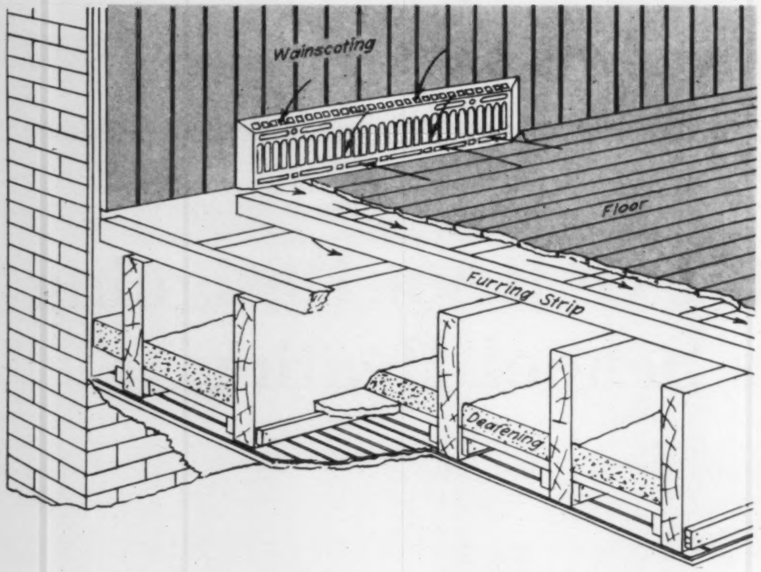
The Original Method

Each building had several enormous chimneys called vent shafts, extending from the basement through the roof peak. Usually there would be at least 2 sq ft of cross sectional area in each vent shaft for each classroom. There would be a cast iron stove in the bottom of the vent shaft, to heat it and thus insure a positive draft. The heat from the stove, of course, went out the chimney-top to heat the county, but the stove was

SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems. His 50 years of service in heating, ventilating and air conditioning were marked recently by his fellow engineers. One of his earliest projects, continuing since 1908, was the design and supervision of the heating and ventilating of the Toledo Public Schools.



1 IN 1908, a single furnace, encased in brick and supported on iron bars, heated one or more classrooms. Outside air, admitted into the cold air room beside each furnace, flowed upward around the furnace



2 UNDER EACH WINDOW was a 30 x 2 in. grille covered opening — six to eight in each room — through which ventilating air left the classrooms

considered to be worthwhile as a ventilating accessory. The smoke flue from the furnaces was separated from the vent shaft by a thin wall and helped by means of its warm side to encourage the draft.

The classroom floor joists usually were at least 2 × 12 in. pine, and 2 × 4 in. wood super-joists were laid transverse to the 2 × 12 in. joists. See Fig. 2.

The floor was nailed to the 2 × 4 in. strips. Under each window an opening was in the baseboard, and the floor was cut to give a 30 × 2 in. slot between the room and the space between the joists formed by the floor above them and the ceiling under them. Thus each classroom had six to eight ventilating openings, each covered by a cast iron grille.

Some of the partitions of the first story were furred out, and wall plates were omitted at the studs, so that air from each second story classroom could flow down to the basement through the furred-out spaces. Air from the first and second story joist spaces was then passed through lath and plaster ducts against the basement ceiling and, ultimately, was conducted to an enclosure at the base of each vent stack, called foul air ducts.

Each two superimposed classrooms were heated by a single furnace, as shown in Fig. 1. The furnace always was encased in brick, with a brick cover supported on iron bars. There was a basement window in a small room behind or beside each furnace, so that outside air could enter, flow upward around the furnace between it and the masonry, and could then enter a brick flue that ran vertically to each classroom. At the inlet to each of these flues there was a single damper, hinged at the bottom and swinging into the flue in such a way that in one position hot air from the furnace could enter, while in the other position of the damper, the hot air would be closed off and cool air from under the furnace could enter the flue. A chain was extended from the damper to a device in the respective classroom whereby the teacher could adjust the temperature of the air delivered.

The first story air supply flues, being less tall than the second story supply flues, usually were about 20 percent larger than the second story flues.

Because of the excessive cost of operation and maintenance of these systems and the fire hazard of the large chimney shafts, the Toledo Board of Education in 1908 decided to install new heating systems. I was retained by the board to design these systems.

Systems Redesigned

My scheme was to install within each of the old furnace casings, several layers of 9 in. thick indirect cast iron steam radiation, using all of the existing masonry air supply flues. Air from outdoors was delivered by a single central supply fan through a trunk line metal duct to each old furnace casing.

The underfloor former foul air ducts all were sealed off, and new classroom exhaust openings were cut directly into the old masonry vent stacks.

Two steel boilers were placed in each building. Steam circulation was obtained without pumps since at least 36 in. were available from the boiler water level up to the bottom of the lowest indirect steam radiation. The old manual single blade air mixing dampers, in the air supply flues, were each replaced with two interconnected double dampers, each pair adjusted by a thermostat in the respective room. Direct steam radiation was installed in toilet rooms, offices, corridors and in other rooms that had no air supply flues.

New Installations

As a result of the satisfaction with these systems, I was later engaged to design the heating systems for several new Toledo school buildings and have been at it ever since. The earlier ones each had two horizontal return tubular boilers with extra high combustion chambers and refractory ignition arches. In many of them, the air at about 70 F from a central supply fan was delivered through a walk-through masonry tunnel — usually under the corridor — to reheating coils at the bases of groups of supply flues, after the manner of the rebuilt old furnace heating systems. This general scheme was followed for the large Scott and Waite high schools, except that a greater proportion of the heat delivery was by auxiliary direct radiators and that water tube boilers were used. The Broadway junior high school, built many years later, marked a departure, since the joists in this building are made of skeleton steel with reinforced concrete floors. The warm air supply for each classroom in this school flows from the conventional masonry flue into the entire joist space of each room between the floor above the joists and the ceiling below them. The air supply then enters the room through a perforated baseboard all the way along the outside wall. The floor, therefore, always is gently warm. This was a pioneer job some 25 years ahead of its expectation. It had baseboard type warm air delivery, radiant heated floors, and thermostatic control of every room.

The principle used at the Broadway high school job was carried out on many smaller and more recent Toledo elementary schools, with concrete joists. The supply air flows out across each classroom between several adjacent joists, to rise along the window wall around the steam radiators.

The Macomber technical high school was the first departure in Toledo schools from steam heating, due to a large proportion of workshops and a contemplated occupancy during unconventional hours. The boilers are of downdraft type and do not generate steam, but are full of water. The water circulates in each boiler and then through the radiation by means of pumps. The fuel and maintenance records of this large high school have indicated economical costs as compared with other high schools in Toledo.

As a result of this experience at the Macomber high school, circulated hot water has been used in at least 10 recent Columbus, Ohio, elementary schools.

All of the Toledo schools that are heated by steam, since the first six ancients, have vacuum pumps and thermostatic traps. They have separate gas burning heaters for domestic hot water.

The steam boilers in the older, larger, buildings were operated at about 50 psi, to run the fans and pumps with engines. In recent years, however, following the reliability and lower cost of public service electric energy, the provision of steam engines and pumps in school buildings is obsolete. However, the old easygoing low pressure engines continue to function in several schools that have 30 or more classrooms and auditoriums and gymnasiums. Boilers with down draft grates served for many years to control the excess smoke. The more recent plants that burn coal, of course have mechanical stokers.

Ventilation Rate Changes

We have seen the statutory rate per pupil per minute of classroom ventilation change from complete absence, to the discredited and excessive 30 cfm, with no recirculation allowed. At present, a provision of 15 cfm of new air generally is accepted, with permitted recirculation of a large percentage of that air. School ventilation by windows never has proved acceptable or economical. Control of temperature by thermostats definitely is required for health and efficiency.

ON THE JOB

Plastic Piping Serves Drug Producer

. . . resists corrosion

Unplasticized polyvinyl chloride piping has been installed for the Eli Lilly Co., Indianapolis, to solve a variety of corrosion problems and to achieve lower maintenance costs. The firm is one of the world's largest drug manufacturers.

In one application, 3/4 in. PVC vacuum lines are installed on vessels used in precipitating ether, according to Tube Turns Plastics, Inc. Also, 1 1/4 in. PVC piping is used in a drainage system for handling spent hydrochloric, sulfuric and other mineral acids at room temperature. A 1 in. PVC line carries dilute — 1/2 of 1 percent — sulfuric acid to a cooling tower, to maintain the water's pH factor at 5.8 to 6.3.

The PVC piping is fabricated with injection molded screwed fittings. The installation is expected to be permanent and require no maintenance. Because PVC is inert and non-toxic, it is said to contribute to the high quality of the company's products. The resistance to corrosion has been found to cut maintenance costs.

1 UNPLASTICIZED polyvinyl chloride 3/4 in. vacuum lines serve ether precipitating vessels

PRACTICAL PIPING PROBLEMS

By Bill Dopp

How *Not* To Anchor U Bends

A broken anchor, a defective piece of pipe, three leaky couplings, and then a full break in a 3 in. steam pipe, the steam narrowly missing two nurses, add up to a case of "Bad Anchors." In exposing the faulty installation, Mac wins a bet and leaves a prescription.

"FOR HEAVEN'S SAKE, Frank! What's happened to you?" asked Martin MacVane anxiously of Frank Baker, engineer at the Bluebank hospital. "You look as if you had seen a ghost."

"Gosh, Mac," replied the agitated engineer, "I'm scared." He shook himself, as if to throw off some apprehension. "I'm glad you dropped in. I sure need someone to talk to."

"What happened? Have an accident?" Mac asked, handing him a cigarette. "Tell me about it."

They walked to the desk in the corner of the boiler room. When they were seated, Mac looked around. "Everything seems to be all right here," he observed quietly. "Give out," he demanded, smiling broadly. "What's the matter?"

"Thanks for the smoke," said Frank, inhaling deeply. "I'll be all right in a minute. The accident occurred in the tunnel to the nurses' home. The three inch steam line along the ceiling let go. There were a couple of nurses in the tunnel at the time. It scared the daylights out of them. I guess one of the girls is still hysterical. If they had been any nearer to where the break occurred, they would have gotten the full blast of 150 pound steam." He wiped his brow. "I shudder every time I think of what could have happened."

"You say a steam line let go?" asked Mac, astonished. "I haven't heard of such a thing in ages! What could have caused it?"

"I don't know," admitted Frank. "Ever since the hot water line started leaking, I've been worried about the tunnel piping. First, an anchor let go. The nurses thought someone had set off a bomb. Then there was a defective piece of pipe in the steam line, and we had to replace an expansion U bend. We've had three cases of leaks in that hot water line right at the couplings that join the bends to the straight pipe. . . . Now this break." He shook his head doubtfully. "Mac, I'm afraid there's something wrong with that piping. And I don't know what it is!"

"I'll say something's wrong!" declared Mac emphatically. "Any series of failures like that demands investigation. Let's go into the tunnel and have a look."

They left the boiler room through a passage that emerged in the hospital basement at the end of a broad tiled, brilliantly lighted tunnel ramp. As they entered the tunnel, Mac could see water running down the walls. The floor was wet. At the scene of the break, everything was dirty and wet. The twisted ends of the pipe hung free. Both openings were still dripping.

Pipe Is Broken Off Clean

Mac reached up, pulling down the end that had a pipe coupling attached. He whistled in amazement. "This pipe is broken off clean." He jumped up to catch the end of the bend. "Look, Frank, this break started right in the root of the threads. It's as clean as a saw cut." Mac began to look around some more. "Oh!" he mumured under his breath. "So that's it."

"What's the matter?" Frank demanded, as he saw the expression on Mac's face change.

"Let's follow this line. Where does it go, and why?"

"These lines were put in about six months ago to serve the new laundry in the basement of the nurses' home. When they built the home, all the laundry was done in the hospital

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Bill Dopp has had some 40 years of experience dealing with piping, including a long stretch as a sales engineer. He is devoting part of his present leisure to writing of his many piping experiences. All the names used are fictitious.

laundry. Last spring they added a hundred bed wing. The old laundry couldn't take care of the added load, and there was no room for expansion. So the nurses have used part of the basement in the home to do their own laundry work.

"There's the three inch steam line, a two inch hot water line and a ¾ horsepower circulator for the hot water."

"What heats the home?" asked Mac. "You don't depend on this line for that too, do you?"

"No," responded Frank. "The heating and domestic water lines for the home go through a separate pipe tunnel, off here to the right. These lines were an afterthought. There was no room to carry these pipes; so they used this tunnel and hung them from the ceiling."

Anchor Bolts Sheared

They had come to a rather sharp angle to the left. Frank pointed to the steam pipe. "See that anchor? Well, it doesn't hold anything. One night about supper time there was an explosion down here in the tunnel. I told you the girls thought it was a bomb. We looked but couldn't find a thing that could have caused the noise. I was sure they were dreaming." He chuckled. "But I was surprised one day when my assistant told me this anchor had come loose. We got up there for a look and found all four of the bolts sheared off clean. That must have been the bomb."

He shrugged. "I figured if the line got along without the anchor that long, why disturb it. Maybe that's what has caused all this trouble."

They had reached the end of the tunnel, where a sharp turn led to a stairway. Here the pipes turned upward, the two smaller ones resting on a shelf-like support, fastened to the wall under the pipe shaft. The 3 in. pipe had a separate support. Looking the situation over, Mac remarked, "They put a nice water leg on that steam pipe. Does the trap keep it clear of water?"

Blowdown Connection Added

"It's all right when the laundry is running. We shut down the steam Saturday and Sunday, but I keep the hot water on. The girls are allowed to use the laundry when it's not working." He pointed to a connection at the bottom of the water leg. "Before we turn the steam on Monday morning, we open this three inch gate valve, leaving it wide open until the line is clear of water. The valve wasn't there at first. A couple of times, I thought the water hammer would tear down the whole line. So I got the contractor to put in this blowdown connection."

"Had any trouble since then?"

"Nothing serious. We get a bump or two once in a while, but the line clears itself in good shape."

"How long is that riser, Frank?" inquired Mac, eyeing the support that held the steam pipe.

"About fifteen feet, I should say. We're on the opposite side of the street from the hospital. The tunnel had to go pretty low to avoid the sewers, water and gas lines under the street. These lines go to the ceiling of the home basement."

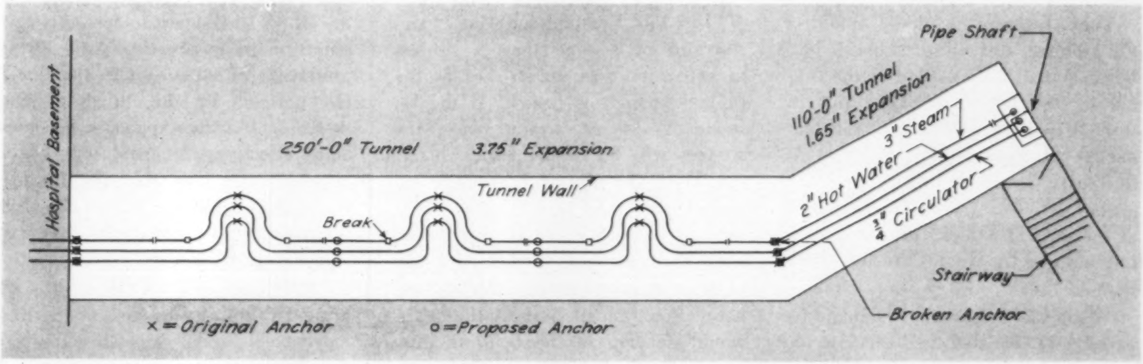
"What crushed that covering above the bracket, Frank?"

"Where?" Frank looked closely at the pipe and reached for the flashlight in his hip pocket.

"Gosh, Mac, I don't know. Looks as though there is something behind that pipe. Wait a minute. There's a step ladder in the passage at the top of the stair. I'll get it."

Wrong Way Expansion

Mac sized up the piping system, trying to calculate the distance to the turn. "Something has forced the expansion in that line in the wrong direction," he said to himself. "I'll bet it's the old brick again." He



THEY STUDIED the architect's drawing. "Look here, this section of the tunnel is 250 ft long. They put in three expansion U bends, with anchors at the hospital end and at the turn in the tunnel. Then they anchored each of these bends at the top. That looks fine on paper but it's exactly what's causing those lines to break."

was grinning broadly as Frank returned with the ladder. "Want to make a bet, Frank?" he asked.

"About what?" demanded Frank.

"That when they installed the new blowdown, one of the boys put something behind the pipe to hold it steady and forgot to take it out when they were through."

"You've won that bet already," replied Frank from the top of the ladder. "Get up here and see."

Mac climbed up with the light. Behind the pipe, pressed into the covering and jammed against the wall, was a husky piece of 2 x 4 in. lumber. Mac laughed. "No wonder your anchor let go," he said. "Sort of made this roller here useless, didn't it?"

"I'll say it did," replied Frank. "Someone is going to catch Hail Columbia for this."

"Hold on," quietly warned Mac. "This is responsible only for the anchor at that corner. The broken bend connection is something else again." He got down, returning the light. "Let's go back to your desk. Have you got a layout of this tunnel?"

U Bends Were Restrained

They sat at the desk, studying the architect's drawing. "Look here," began Mac. "This section of the tunnel is 250 feet long. They put in three expansion U bends, with an anchor at the hospital end and at the turn in the tunnel. Then they anchored every one of these bends at the top. That looks fine on paper, but it's exactly what's causing those lines to break."

"Wait a minute," commanded Frank. "That's what the bends are for — to take up the expansion. It says here that the expansion in that line is 3.75 inches. With three bends to take care of it, that looks all right!"

"You've missed the point, Frank," asserted Mac. "True, each of these has only one and a quarter inches to take care of. But the way they've anchored that line, the bends aren't permitted to do the work they were intended to do."

"Just how do you make that out?"

"Here, I'll show you," declared Mac, picking up a pencil. He made a crude sketch on the folded corner of the blueprint. "Suppose we take a line that is anchored at both ends. We'll put an expansion bend in the middle of it. Now, if we heat that line, it will expand, the added length being absorbed by the bend. But the line itself doesn't remain straight. It bends upward, like this, toward the loop of the bend, forcing the top of the bend away from its former position. The more expansion it absorbs, the farther the bend will travel in that direction."

"I can see that something like that has happened, though I never thought about it before now. With the anchors at the top of the bends, the pipe would have to go the other way. What difference does it make?"

Why Do Stresses Break Pipe?

"Just this," expounded Mac. "Any restraint of a pipe that is subject to expansion sets up stresses in the piping when it is heated. If the restraint is in the wrong place, the stresses will be in the wrong place, too. With the restraint properly installed, the stress in this pipe would tend to be rather evenly distributed over the entire U bend, with the highest stresses at the top of the bend. Some small part of the stress would develop in the bending pipe and in the quarter bends. The whole structure would respond naturally to the changes of temperature and there would be no trouble."

"I can follow you so far, but I still don't see that those stresses should be great enough to break the pipe."

"All right. Let's start over." He drew three swift sketches on the print. "Here are three pipe lines. The first is installed, but both ends have a gap for pulling the line up cold. The shape of the expansion U bend is just as it arrived on the job."

"Okay, then what?"

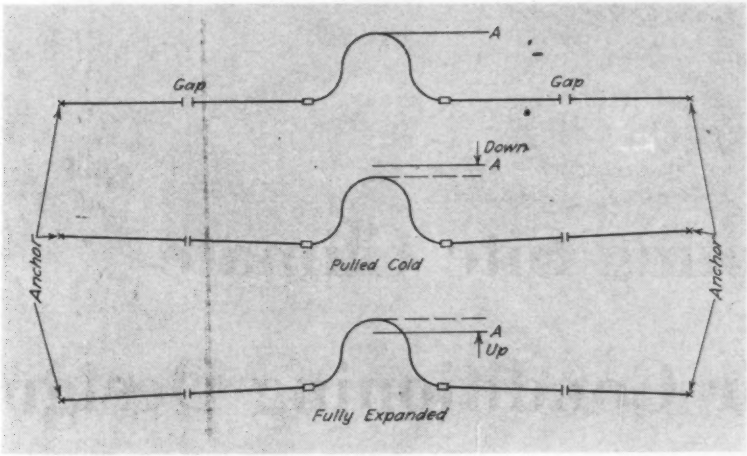
"Now we put a jack between the two legs of the bend and spread them apart. By making up the two unions tight, we are ready to put a cold strain on the bend when we release the jack. If we have not tried to restrain the pipe or bend it with anchors or guides, the pipe will look like this. The bend will have moved down toward the pipe, and the line itself will be bent away from the bend."

"Yes, I can see that the pipe will have to respond to the pull, and that this is the only way that it can respond." The engineer frowned. "Now you heat the pipe. What then?"

"As the pipe warms up, the cold strain is relieved and the bend moves back into its original place, with the line straightened out. At this point, there is practically no stress produced by expansion in the line." He pointed to the third of the sketches. "As the expansion becomes more effective, the bend will begin to move away from the pipe, forcing the line to follow. When the full temperature is applied, the line will look like this."

"Are you sure of that, Mac?" argued Frank. "Why doesn't the line move back in the same direction — the direction you call downward?"

Mac straightened up, turning Frank's question over in his mind. "Just how do I explain that?" he



"WITH THE RESTRAINT properly installed, the stress in this pipe would tend to be rather evenly distributed over the entire U bend, with the highest stresses at the top of the bend."

thought. Finally he chuckled. "Frank, did you ever have one of those rattan canes at the circus?"

Rattan Cane Explains Stresses

"Sure, who hasn't?" he grinned.

"Do you remember how, when you took an end in each hand and tried to bend the cane 180 degrees, it pulled your hands away from you, so that by the time you had made the complete bend, you had to strain to keep them close to your body?"

"Well, yes. So what?"

"It was the stresses building up in the cane that were pulling your arms. Just so, the stresses building up in the bend from the effects of the expansion pull the bend and the line upward, until the line angles in the direction of the bend and stresses are distributed mainly at the back of the bend."

"I'm beginning to see what you are driving at, Mac," declared Frank. "When they put those anchors at the tops of the bends, they prevented the natural movement of the whole structure." He paused thoughtfully. "But, still — why the break?"

Couplings, Threads Weak Spots

"In any structure that is under stress, there is likely to be a concentration of stresses at any weak point in the structure," explained Mac. "This is especially true if the stresses are found for any reason to be forced into unnatural patterns. Here they have put their couplings at each end of the bends, moving the unions farther along the line."

"And those couplings are the weak spots," quickly interrupted Frank.

"Right," echoed Mac. "The real weakness, however, is the threads on the ends of the bends. Under a microscope the root of those threads would show tiny cracks reaching into the wall of the pipe. When you concentrate severe stresses on such a thread, it does not take long for the cracks to spread. Once started, your pipe is gone."

"In other words, the whole installation is ruined right now."

"Not necessarily," said Mac. "Probably most of it can be salvaged by careful inspection and running a hydrostatic test. If you give each of those couplings even a very small part of a turn, you will probably break any thread that is weak enough to fail when the line is properly installed."

"What is the proper way to install that line?"

Remove Anchors from Bends

"Take out those anchors on the bends and put them in the middle of the spans between the bends. You could leave them out altogether, as long as the line is anchored at each end of the long tunnel." Mac spread his arms to illustrate. "The stresses will tend to equalize over the entire line. Unless you have some terrible weak spot, they cannot concentrate anywhere." Mac paused, frowning.

"What's the matter?" asked Frank.

"Nothing," replied Mac. "I was just figuring. I'm sure that if you replace those anchors with flexible hangers and test that line, you'll have no more trouble."

"What about that broken anchor at the bend in the tunnel?" demanded Frank. "Shall we leave that out, too?"

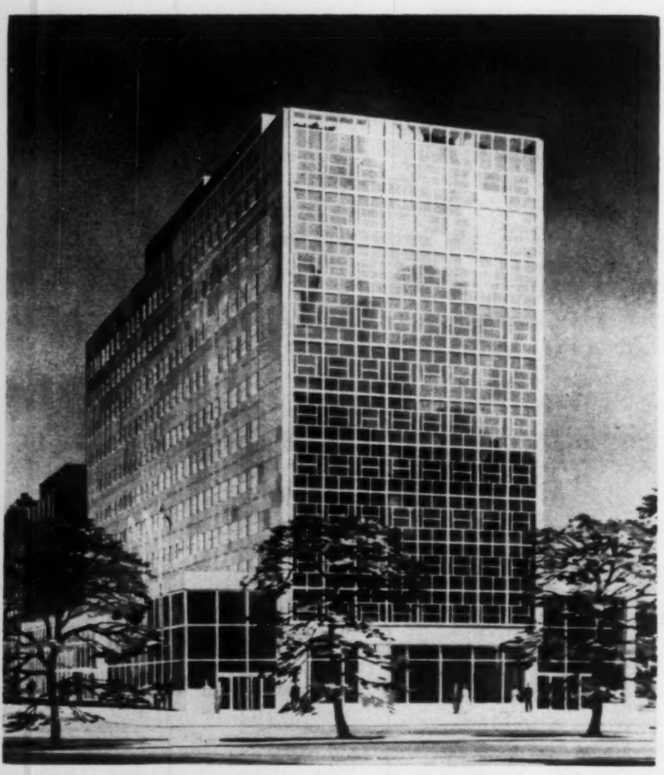
"No," replied Mac. "Remove the piece of wood, and make sure that nothing holds that end of the line. Then replace the anchor bolts that were sheared." He paused. "By the way, be sure your down gradient on that steam line is uniform throughout its length. Water hammer might produce a greater hazard than the one you're trying to cure."

"Mac," said Frank, "I don't know how to thank you for being here and clearing the air this morning."

"Keep your chin up, Frank," urged Mac. "We've all had bad times and most of us have survived." He shook hands with the engineer. "So long."

Predicting Site Climate for Air Conditioning Design

By A. Donald Hay



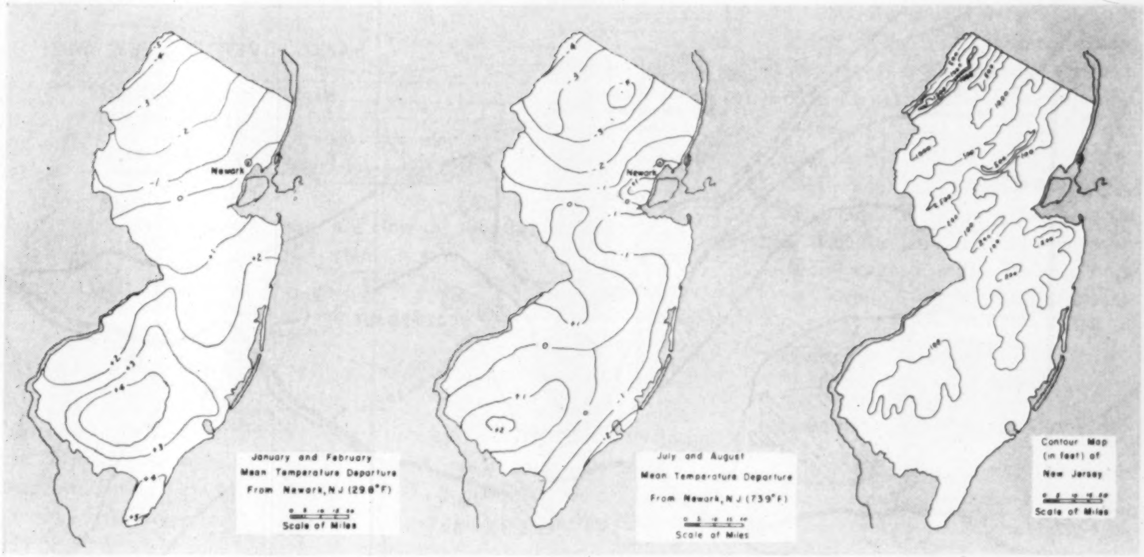
DESIGN PREDICTIONS for air conditioned buildings like this must take into account atmospheric changes away from the weather stations

WEATHER ANALYSIS pays dividends in the design of air conditioning systems that function efficiently and economically. In one case, an increase of only 1 F in the wet bulb design temperature would have cost an additional $1 million for the required air conditioning equipment.

Therefore, it's of the utmost importance to determine the exact weather conditions at the installation site, which may vary significantly from those recorded at the Weather Bureau station. Here is a method for predicting them.

Among the local weather characteristics considered in establishing design conditions for air conditioning installations are the dry bulb, wet bulb and dew point temperatures, wind velocity and solar radiation. And while from these factors design conditions can be predicted for a standard louvered thermometer shelter at a Weather Bureau station,

. . . how to predict microclimatic design conditions, and why they're important



1a WINTER MEAN TEMPERATURE departures from a Weather Bureau station are shown here as isotherms

1b SUMMER MEAN TEMPERATURE departures from the weather station are generally less than those for winter

1c KNOWLEDGE of temperature in isotherms and topography in contour lines enables accurate prediction

VARIED TOPOGRAPHY IN NEW JERSEY GREATLY AFFECTS LOCAL TEMPERATURES

for practical purposes, two additional aspects of microclimatology must be considered in the design of air conditioning systems away from the weather station.

First, there is a definite change in atmospheric conditions as one walks away from the weather station. Second, conditions change rapidly in the lowest 3 ft of the atmosphere. Weather instrument shelters are usually mounted 6 ft above the ground except in cities where they are on roofs.

With these two factors in mind, one can more accurately predict weather conditions at the design site.

For example, New Jersey is 170 miles long. Handbooks give design conditions for no more than five of the cities, all near the center of the state. This information is often inadequate where accurate design conditions are desired, for there is great variation in the topography in the state.

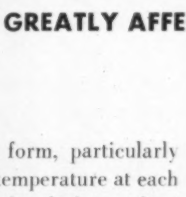
However, weather data gathered by two dozen Weather Bureau stations throughout the state is available in published form, particularly the average mean temperature at each substation.[28] Calculated from these figures, the mean temperature departure from the Newark station graphed for two winter months and two summer months is shown in Fig. 1a. With this information for dry bulb temperatures, local design conditions may be accurately predicted from the extensive information available for the larger stations such as Newark.

Numerous examples of microclimatic conditions are cited in the literature. It is often possible to locate information which is directly applicable in the problem being investigated. The present tendency is to gain an expansion of the useful range of each Weather Bureau station by a greater knowledge of microclimatology rather than by expanding the network of stations.

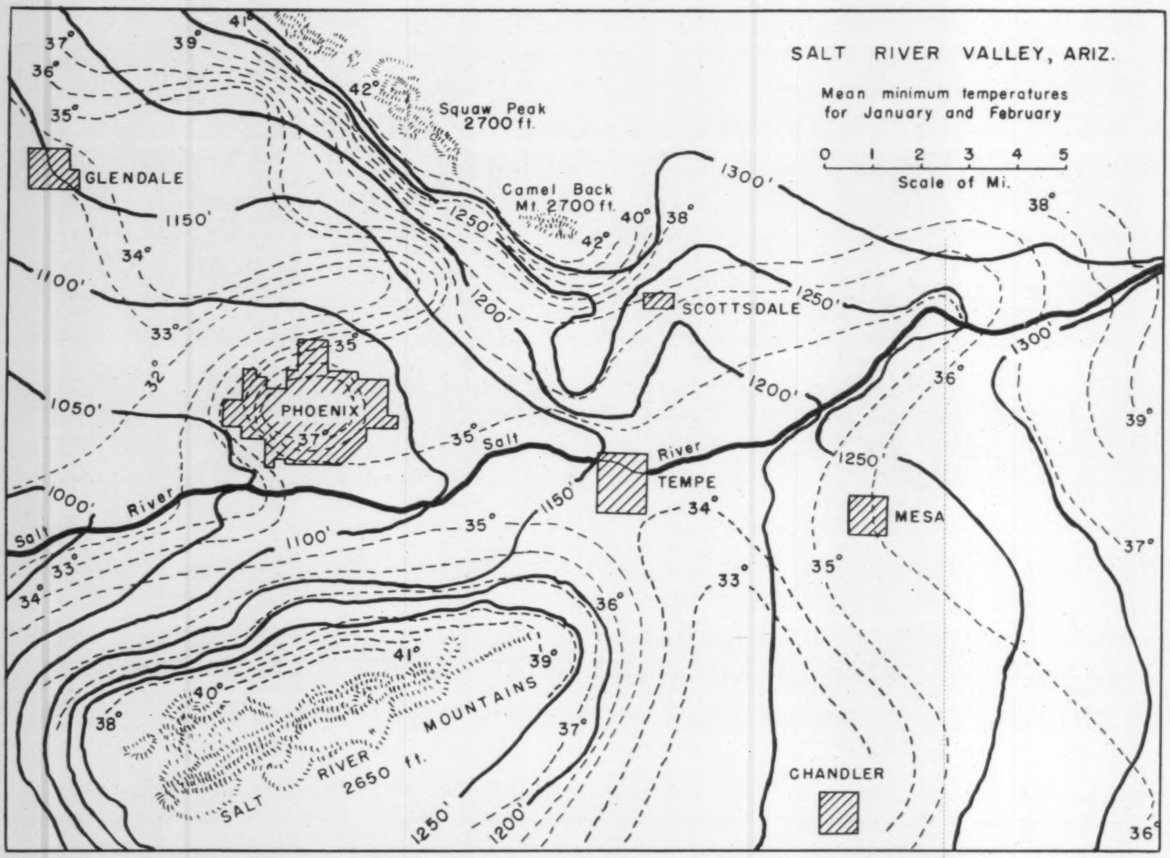
The analysis of the unknown microclimate can be predicted, based upon the following considerations. First, consider the microclimate at the nearest observation stations. Next, determine the radiation relationships at the unknown microclimate, which are based upon the albedo of the ground, direction and inclination of the slope, shading by mountains or forests, and the elevation and clarity of the air.[38]

Strong prevailing winds tend to lessen the above microclimatic factors because of the thorough mixing of the air. Where moderate or weak, the wind is affected by peaks, slopes, roughness of surface, and open water.

The combination of the above conditions determines the microclimate.



Mr. Hay has had experience in the advanced engineering section of the air conditioning division of a prominent manufacturer, in the air conditioning design section of a well-known firm of consulting engineers, as a teacher of air conditioning in the school of engineering at Princeton University, and as a senior staff engineer at the Franklin Institute Laboratories for Research and Development.


SALT RIVER VALLEY, ARIZ.
Mean minimum temperatures for January and February
0 1 2 3 4 5
Scale of Mi.
Squaw Peak 2700 ft.
Camel Back Mt. 2700 ft.
GLENDALE
SCOTTSDALE
PHOENIX
TEMPE
MESA
CHANDLER
Salt River
SALT RIVER MOUNTAINS 2650 ft.
1000'
1050'
1100'
1150'
1200'
1250'
1300'
32°
33°
34°
35°
36°
37°
38°
39°
40°
41°
42°

2 THE MEAN MINIMUM air temperature drops 7 F in a valley which decreases in altitude 300 ft in 25 miles, but the air temperatures in Phoenix show the heating effect of the city

• understanding the microclimate

The site prediction is dependent upon the temperature represented as isotherms in Fig. 1a, 1b and upon the topography shown as contour lines in Fig. 1c. There are several reasons for this dependence. The density of air varies with the temperature and pressure of the air. Air with a high density will descend and displace air of lower density.

Air Density a Prime Factor

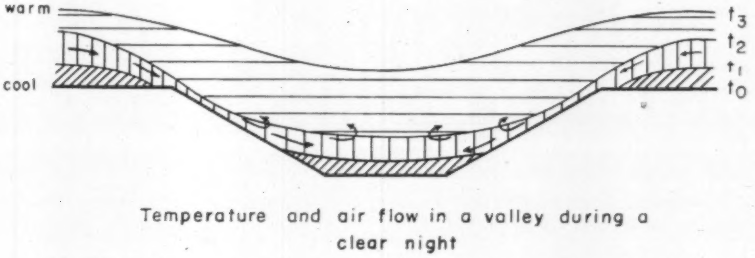
Further, heavy air and light air are but one substance which can be mixed together by eddy diffusion, thus destroying the pressure difference causing flow before all of the cold or heavy air has reached the lowest elevation. Thus, as the cool air descends into a region of higher pressure, the compression raises its temperature approximately 1 F for every 300 ft descent, and the warmer air which is displaced cools down correspondingly upon rising. This reduces the pressure causing the air movement.

Effect of Elevation

From a 300 ft radio tower in a valley near Medford, Oregon, temperatures can be read above the valley floor as well as up the sides.[36] (See Fig. 3.) The warmest portion of the valley is near the rim, and it is there that flowers are often most prolific. Just before daybreak, one January morning, the difference in temperature between the floor of the valley and a point 225 ft above the floor varied from 15 to 30 F.

Cold "Lake" of Air in Valley

The cool air which reaches the floor of the valley forms a cold lake. If the floor of the valley slopes downward, this cold lake will flow down the slope at night causing a "down-valley" wind of cool air. On a sunny day the surface of the earth is warmed to a temperature above that of the air and the reverse conditions occur, causing an "up-valley" wind. These winds often have a strength of 12 fps, with the "down-valley" wind generally stronger than the "up-valley" wind.



3 COLD AIR FLOWS down the sides of a valley, and forms a cold "lake" on the valley floor. Radiation from the surface into space occurs at evening

Arizona's Salt river drops 300 ft in 25 miles. During this travel, the mean minimum air temperature along the river drops from 39 to less than 32 F. At night cool air forms a cold lake all along the river. Most of the cool air flows down the valley, approaching Phoenix from the east at an average velocity of 5 mph. The Weather Bureau, in the center of the city, has recorded a mean minimum temperature of 37 F. The heating effect of the city is evident.

How Oceans Affect Weather

Properly observed air temperature measurements on the open sea show that the direct absorption of insolation by clean air causes an insignificant temperature rise at low altitude, actually less than 1 F. This is about the same as the diurnal temperature rise of the surface of the sea.

Water has a higher specific heat than land and, in addition, is continually being mixed. For this reason bodies of water are normally warmer than the land in the winter and cooler in the summer, and they are often cooler than the land during the day and warmer at night. The total variation in temperature of the surface water of the ocean is only 60 F, from 88 F near the equator to 28 F near the poles. In Asia alone, the shade temperatures vary more than 170 F.[6]

When the land is warmer than the water, an updraft of air is caused over the land. The low cool air from the water then moves in over the land to replace it. This local air movement may have a cooling effect of 10 or 15 F, and penetrate inland as far as 15 miles. When the water is warmer than the land, the winds blow in the opposite direction unless altered by prevailing winds. Small and shallow lakes are not this effective in altering the weather.

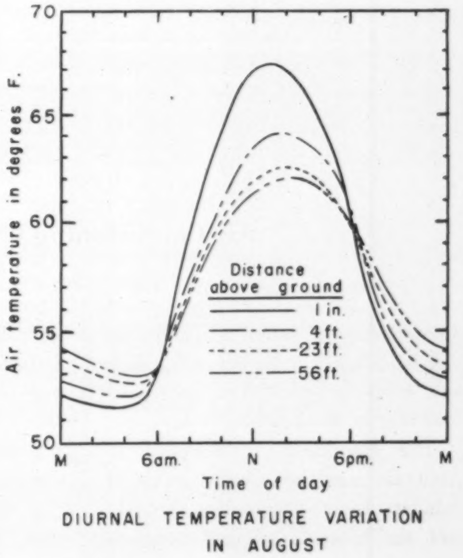
Forest Tempers Air

It is difficult to forecast the reduction in temperature caused by evaporative cooling in a wooded area without consideration of the whole atmosphere affected by the forest. However, it is known that the forest diminishes the diurnal temperature fluctuation in the trunk space in comparison to the open country. When deciduous trees are free of their leaves, the temperature fluctuation is reduced by 2 F, but during July and August the foliage of beech trees cuts the temperature fluctuation 8 F. Corresponding values for scotch pines and firs are 2 and 6 F.[39] Beech trees have the greatest "flywheel effect" of any tree tested.

• extreme changes near ground

The microclimate becomes more extreme the closer we approach the ground. The daily course of temperature variation in England[41] is shown in Fig. 4. It is interesting to note the isothermal conditions which exist in August at 6 a.m. and 6 p.m. In January this isothermal period occurs at about 8 a.m. and 5 p.m. During the day, when the ground is receiving heat, the air temperature continuously increases in the direction of the earth. Within the lowest six ft toward the ground the vapor pressure, specific humidity, and usually the relative humidity, also increase. The amount of increase depends upon the strength of the insolation and the surface of the ground. During the night, when the ground is radiat-

4 DAILY TEMPERATURE variations shown here, illustrate that changes in microclimate are more extreme closer to the ground



ing heat, the air layer next to the ground becomes colder than the air immediately above it. At a point which is often 50 ft above the ground, the air temperature is at the maximum. Above this point, the normal lapse rate of 1 F drop in air temperature for every 300 ft increase in elevation forces the temperature down again. The stronger the insolation, the greater the diurnal variations.

The apparent contradictory relationship between temperature and elevation in Figs. 1 and 3 should be understood. Both maps show approximately the same change in elevation. The New Jersey map, however, covers an area many times larger than that of the Salt river valley. The thin layer of cool air near the ground in the evening can flow down the slopes of the Salt river valley but it cannot flow across New Jersey, for numerous small valleys which pass from the southwest to the northeast stop the flow and the distance which the air would have to travel is too great. As a result the temperatures in the northern half of New Jersey closely follow the lapse rate, while the temperatures in the Salt river valley follow those in Fig. 2.

Thus, the greatest fluctuations in climate occur very close to the surface of the earth. It is in this most vulnerable zone that the air conditioned buildings are placed. Portions of buildings are either set on or into the ground. The annual temperature variations at various depths are very regular and closely approximate sinusoidal patterns. Experiments performed on snow-free ground in Germany[40] are summarized in Table 1. At a depth of 25 ft, the maximum temperature occurs six months after the maximum temperature occurs at the surface. Daily fluctuations of the ground temperature are usually less than 1 F at a depth of one foot.

TABLE 1—GROUND TEMPERATURES vary with the depth below the surface

Soil Depth	1 in.	1 ft	2 ft	4 ft	8 ft	16 ft	25 ft
Temperature variation	36 F	33 F	31 F	24 F	16 F	7.2 F	2.7 F
Time of maximum temperature	July	July	July	August	September	November	January

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Reprints of the entire series of articles by Mr. Hay on weather are available from The Franklin Institute, 20th and Parkway, Philadelphia 3, Pa. The other articles have appeared in the March 1953, April 1953, May 1953 and June 1954 issues of HPAC.

Air Conditioning Overcomes Capital's Tropic Summers

. . . for new Washington apartments

COMPLETE year 'round air conditioning is included in the new ultra-modern 4200 Cathedral Ave. apartment building in Washington, D. C.

The equipment is designed to maintain specified comfort levels of temperature and humidity throughout the capital's tropical summers and all other seasons of the year, according to the Carrier Corp. A single centrifugal compressor of 365 tons capacity satisfies the cooling and dehumidifying requirements for the entire building.

A. J. Howar, owner and builder says, "First class buildings can no longer be constructed in Washington without air conditioning. Aside from necessary cooling, air conditioning provides many other worthwhile benefits, and the filter cleaned air is an important safeguard to health."

Wm. H. Singleton Co., Inc., is the air conditioning contractor.

How To Determine Expansion in Carbon and Alloy Piping

By Robert J. Rubey
Mechanical Engineer

A DIRECT READING chart presented here gives the increment of thermal expansion for a given length of pipe at a given operating temperature. It has been constructed for use with carbon and alloy steel piping operating at temperatures up to 1000 F. Since the increment of expansion is directly proportional to the length of the pipe and is almost directly proportional to the change in temperature, the increments of expansion plot as slightly curved lines on logarithmic scales. The use of the chart should save time and avoid much of the possibility of error introduced by the number of arithmetical operations involved in the usual method of securing the increment of thermal expansion. The chart is in practical agreement with the American Standards Association Code for Pressure Piping.

The chart is direct reading for an initial temperature of 60 F, and for a final temperature between 80 F and 1010 F, and for lengths between 2 ft and 400 ft.

The horizontal lines indicate the final temperature, read from the scale at the left of the chart. The vertical lines indicate the length of pipe in the direction which the increment of thermal expansion is to be determined. The diagonal lines indicate the total increment of thermal expansion.

How to Use Expansion Chart

The increment of thermal expansion is determined as follows:

1) Enter the chart at the left at the final operating temperature and proceed to the right.

2) Enter the chart at the bottom at the actual linear feet of pipe and proceed upward.

3) Read the total increment of thermal expansion from the diagonal lines at the point where the two perpendicular lines intersect.

Example 1

Problem: Referring to Fig. 1, determine the increment of expansion for a piece of steel pipe, 40 ft long, when heated from 60 F to 500 F.

Solution: Enter the chart at the left at 500 F and proceed to the right until you intersect the vertical line representing 40 linear feet. At this intersection read — from the diagonal lines — the increment of thermal expansion: 1.5 in. The initial length of pipe is 40 ft, 0 in. The final length is 40 ft, 1.5 in.

For initial temperatures above 60 F, subtract the difference between the actual initial temperature and 60 F from the final temperaure, and enter the chart at this corrected final temperature. For initial temperatures below 60 F, add the difference between 60 F and the actual initial temperature to the actual final temperature and enter the chart at this corrected final temperature.

Example 2

Problem: A pipe initially at 60 F has dimensions shown in Fig. 2a. From the expansion chart determine what the increments of expansion will be when the pipe is heated to 630 F.

Solution: The chart shows increments of 3 in., 4 in. and 5 in. for the 60 ft, 80 ft and 100 ft lengths respectively. Add these increments to the respective initial pipe lengths and the resultant configuration is shown in Fig. 2b. The increments of expansion, in this case, form a right triangle, with sides of 3 in. and 4 in. and a hypotenuse of 5 in.

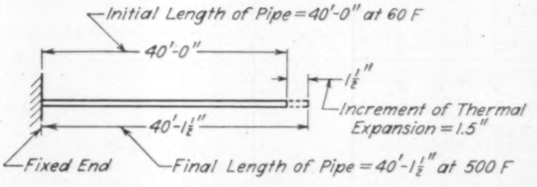

Initial Length of Pipe = 40'-0" at 60 F
40'-0"
1½"
Increment of Thermal Expansion = 1.5"
40'-1½"
Fixed End
Final Length of Pipe = 40'-1½" at 500 F

Fig. 1

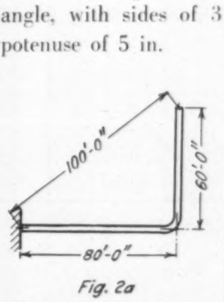


Fig. 2a
Pipe Initially at 60 F

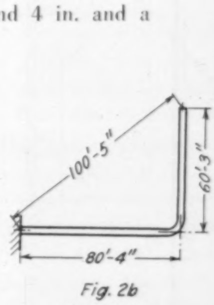
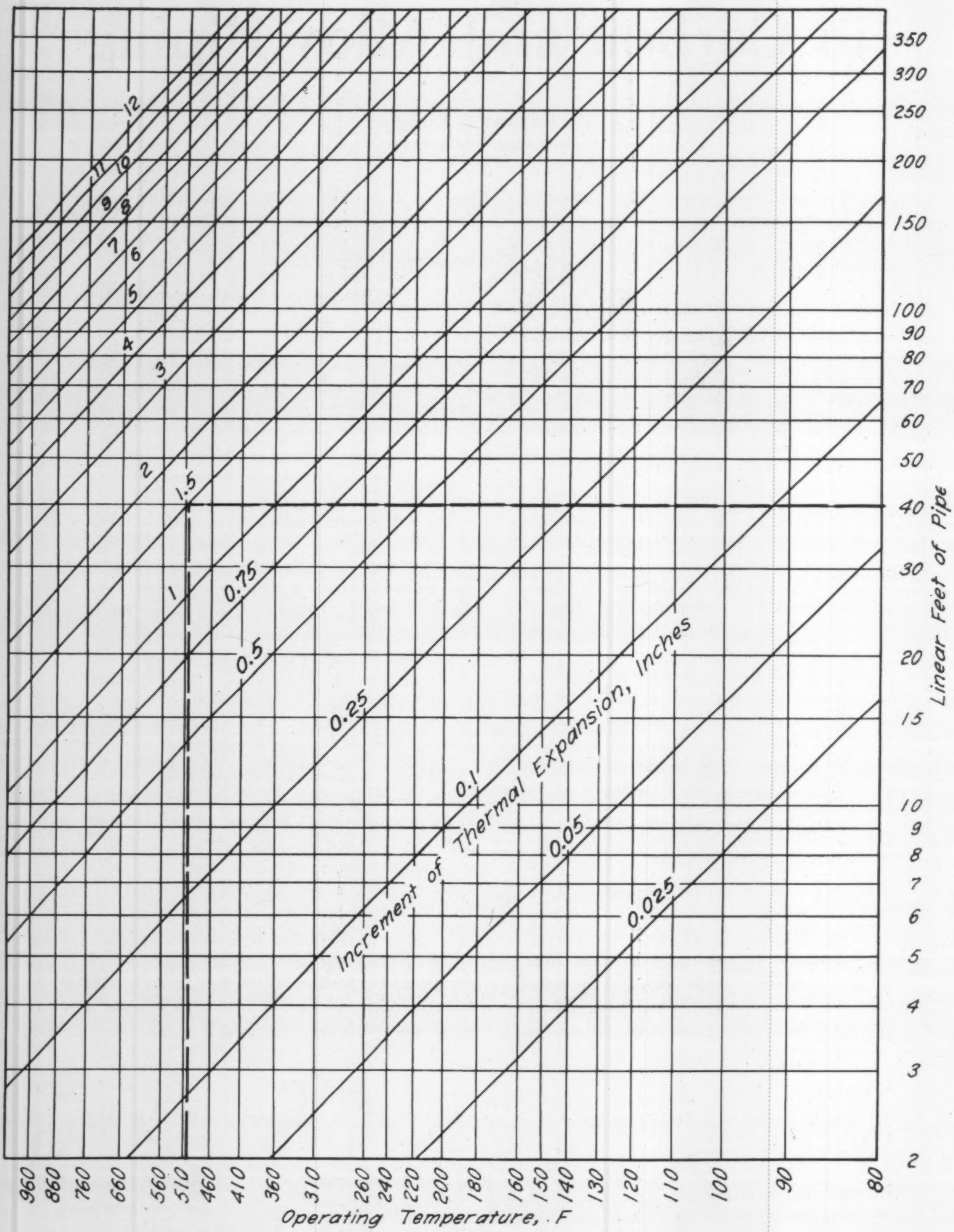


Fig. 2b
Same Pipe
After Being Heated
To 630 F



THERMAL EXPANSION of carbon steel piping of lengths from 2 ft to 400 ft at operating temperatures between 80 F and 1010 F may be read directly from this chart

HEATING, PIPING & AIR CONDITIONING

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Performance and Evaluation of Room Air Distribution Systems

By Alfred Koestel* and G. L. Tuve**, Cleveland, Ohio

This paper is the result of research sponsored by the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, INC. in cooperation with Case Institute of Technology, Cleveland, Ohio

THE OBJECT of the designer of a room-air distribution system is to provide ventilation of an occupied space and to absorb heating and cooling loads. This result must be accomplished without drafts or excessive local air velocities anywhere in the occupied zones. A general method of analysis of air distribution systems for small rooms is offered in this paper, and the results of tests of several systems under controlled conditions are given.

In the early development of both heating and cooling by air systems, it was common to use large temperature differences between the supply air and the room air and to pay little attention to air distribution. The adverse comfort conditions of such systems are now recognized. But when low temperature differences and large air volumes are used, the problem of drafts becomes very important.

SUMMARY — The performance of five residential air distribution systems as a function of winter outdoor temperature and air flow rate is described in this paper. The results are presented in accordance with a criteria of reasonable comfort that can be applied by a designer in selecting the proper system and determining the air flow rates that conform to the climatic conditions of the locality. Reasonable comfort is defined in terms of maximum allowable air movement, maximum vertical air temperature difference, and the probability of objectionable drafts.

This paper attempts to establish a method for determining optimum comfort conditions for high-volume convection systems. Special attention is paid to heating with low supply temperatures, as in heat pump applications.

Evaluation Criteria

Available data on health and comfort are insufficient to give a fully satisfactory basis for evaluating room-air conditions. In this paper the findings of Houghten[1] and his associates and the proposals of Rydberg and Norback[2] were used for the evaluation of effective temperatures and drafts (see Terminology for definitions).

One criterion of good air distribution is a uniform feeling of warmth throughout the occupied zone, *i.e.*, uniform effective temperature due to dry bulb and air velocity. A physiological sensation (change in skin temperature) caused by a change in local effective temperature is therefore called a *draft*. Excessive local air velocities may also be in themselves objectionable, causing movement of the hair, eye discomfort, disturbance of papers or fabrics or directional movement of smoke. In any case it is recognized that objectionability or tolerability are statistical with respect to the occupants. Each given condition will result in a certain percentage of objections, and it is very difficult to produce *any* condition that is voted satisfactory by all occupants.

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**Professor of Mechanical Engineering, Case Institute of Technology. Member of ASHAE.

[1] Exponent numerals refer to References.

Dry-bulb temperature and air motion are the only conditions taken into account in the present evaluation. Humidity is disregarded because extremes of humidity are uncommon in properly conditioned rooms. The mean radiant temperature of all enclosing surfaces is assumed to be within a few degrees of the air temperature in the occupied zone. This is the actual case in most well-constructed buildings served by air distribution systems. Radiant heating and cooling are considered to be methods of absorbing a portion of the thermal load and of compensating for extremes of room-surface temperature due to weather and solar effects.

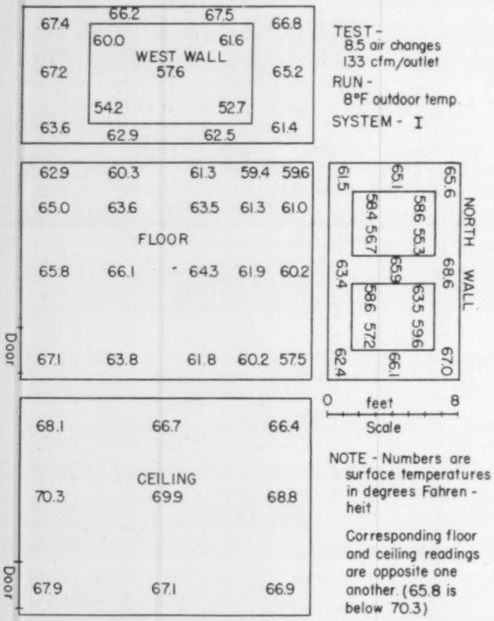

Fig. 1—Typical surface temperatures measured with System I, 8 F outdoor temperature

The Idealized System

An actual system of air distribution is too complex for direct analysis, but by means of simplifying assumptions an ideal or theoretical model may be attained. Such a model will reveal the significant variables and thus act as a guide for the experimental attack and presentation. Consider a system in which the following assumptions apply.

1. An ordinary convection system serves an independent room in a well-insulated structure.
2. The mean radiant temperature of room surfaces approximates the air temperature, *i.e.*, radiant effects are small compared with convection.
3. Normal indoor relative humidities are encountered, without extremes.
4. At each test condition the system is in equilibrium, and maximum comfort is attained at the control point in the middle of the room.
5. Inertia forces predominate as compared with buoyant forces, *i.e.*, the circulation in the occupied zone is mainly by forced convection rather than by natural convection.
6. In the unoccupied zone, adjacent to exposed surfaces, natural convection is important.
7. Differences between heating and cooling will exist.

Based on these assumptions and on the available comfort data, the following theory has been evolved to describe the performance of a room-air distribution system with forced convection: (See Appendix under Analysis.)

1. At any given point in the occupied zone, the magnitude of the air velocity is a function of the flow rate at the supply openings.
2. The vector direction of the air velocities in a room, *i.e.* the flow *pattern*, is a function of the room configuration and of the type and location of distribution

Table 1—Air Distribution Systems in an 18- x 13- x 8-ft Test Room

Three 8- x 18-in. returns individually tested with all systems of air distribution. One return was located low on the inside wall opposite the picture window, another low on the exposed wall below the picture window, and the third high on the inside wall near the corner formed by the two inside walls. When testing a given system, all air distribution outlets were balanced to deliver equal amounts of warm air.

Designation in Figures	Air Distribution System	No. of Outlets	Size of Outlet	Location of Air Distribution Outlets
I	High Side Wall Outlets	2	12 in. x 6 in. approximately 48 sq in. free area per outlet. The vertical bars were set to produce a uniform total spread of 60 deg in the outflowing air.	High on the inside wall opposite the picture window with their centers one foot from the ceiling and one quarter of the length of the room from the adjacent walls.
II	Baseboard Diffusers	3	30 inches in length 4½ in. in height approximately 26.5 sq in. free area	Two of the three baseboard diffusers were located adjacent to the floor on the exposed wall containing the picture window and one quarter of the length of the room from the adjacent walls. The third baseboard diffuser was located adjacent to the floor and centered on the exposed wall containing two 4- x 5-ft. windows.
III	Ceiling Diffusers (Flush Cone Type)	2	7-in. neck diameter	Centrally located each in a 9- x 13-ft rectangle which constituted one-half of the ceiling area.
IV	Ceiling Diffusers (Projecting Cone Type)	2	6-in. neck diameter	Centrally located each in a 9- x 13-ft rectangle which constituted one-half of the ceiling area.
	Perforated Acoustical Baffles as Air Diffusion Outlets*	2 to 5	4 ft long by 6 in. in height approximately 1 sq ft of free area and 4 sq ft of gross surface area	A complete baffle system was installed. The five baffles nearest to the cold walls were fitted with air supply ducts and the number of baffles tested were varied from 2 to 5.

*NOTE: Wedge-shaped perforated aluminum trough filled with a glass fiber core for sound absorption used in connection with luminous ceiling.

system. There may be a difference between heating and cooling.

3. The percentage of occupants who will object to a local *draft* depends on the departure of the local effective temperature from that at the control point, and this difference θ is in turn expressed by the equation:

$$\theta = \Delta t - 0.07V, \text{ (see Terminology and Equation A-4 in Appendix)}$$

where Δt is the departure of the local dry bulb from control temperature and V is the local air velocity, fpm. Still air is assumed at the control point.

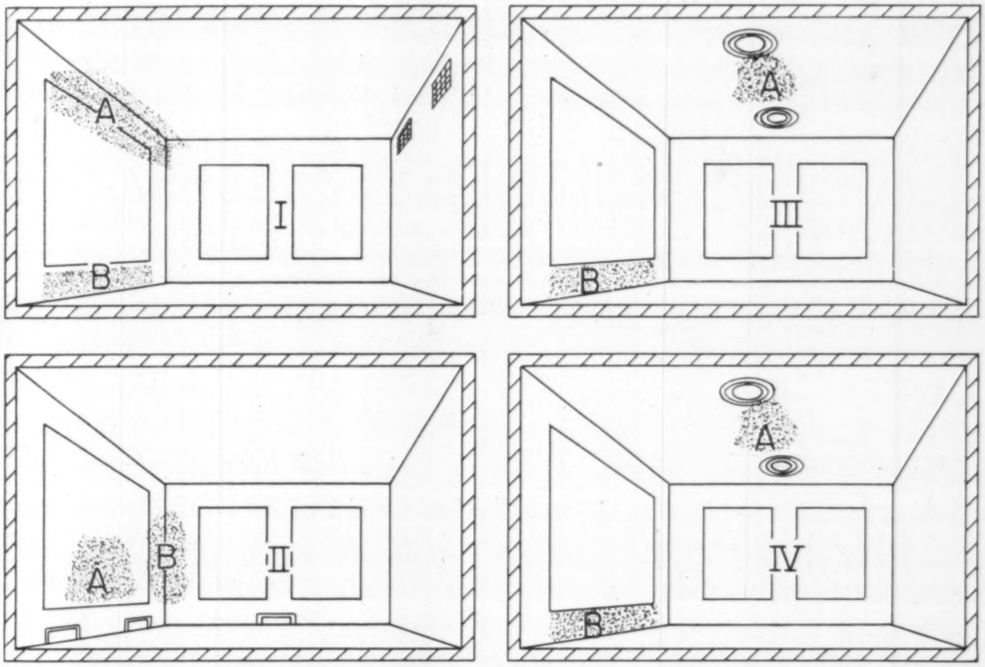

Fig. 2—Test room showing windows, supply outlets and critical draft regions A and B (see Table 1). Roman numerals designate air distribution systems

4. The local dry-bulb temperature difference (Δt) at any point in the air flow pattern depends on the supply-air temperature difference only, and is independent of normal changes in the air flow rate.

5. For a given room, served by a given system, there is one air flow rate and corresponding supply temperature that will result in minimum draft.

Test Room and Experimental Procedure

The test room was 18 x 13 x 8 ft, built to simulate a well-insulated living room with two exposed walls and windows, insulated unheated attic, and an insulated floor with ventilated crawl space. Conventional furniture was not present. The 18-ft exposed wall included a 10 x 6 ft simulated double-glass picture window and two 5 x 4 ft simulated double-glass windows were located on the 13-ft exposed wall. An *outdoor* space was provided on the two exposed walls as well as above and below the room. Air pressure differences between the test room and outdoor space, and test room and laboratory were reduced to a minimum by damper control. This eliminated any extraneous air infiltrations or exfiltrations. Infiltration air from the outdoor space was metered into the test room from perforated panels located on each side of the picture window. Air was supplied to the air distribution outlets from a separate plenum chamber.

Typical heat losses were obtained by designing the exposed surface of the test room for the same interior surface temperatures encountered in a typical well-insulated house. When an outdoor space temperature simulating 8 F outdoors was maintained, the following typical test room conditions were noted.

1. Room Control Temperature (center of room at the 30-in. level): 73 F.
2. Infiltration Heat Loss: 500 to 650 Btu/hr.
3. Total Register Heat Input: 5000 to 7000 Btu/hr depending on air change and type of air distribution system.
4. Surface Temperatures (see Fig. 1).
5. Total Heat Loss (fixed internal heat gain from lights and occupants of 1,000 Btu/hr plus register heat input): 6000 to 8000 Btu/hr.

The occupied zone of the test room was defined as being enclosed by surfaces 1 ft from the walls and 6 ft, 2 in. from the floor. The boundaries of the occupied zone were marked by a grid consisting of strings arranged in 6-in. squares with calibrated air-movement indicating threads in each square.

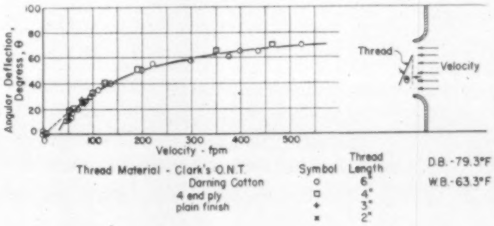

Fig. 3—Calibration of velocity-indicating threads. Identical threads located in each 6-in. square bounding occupied zone. Calibrated with air at 79.3 F db and 63.3 F wb

Table 1 and Fig. 2 provide a description of the five air distribution systems tested.

For each system of air distribution and for each constant outdoor temperature, air at various temperatures was introduced into the test room. The quantity of air in each case was that required to maintain the room control temperature at 73 F. The supply duct dampers were adjusted so that for each system of air distribution the outlets were balanced and delivered equal quantities of air. This was repeated for different outdoor temperatures.

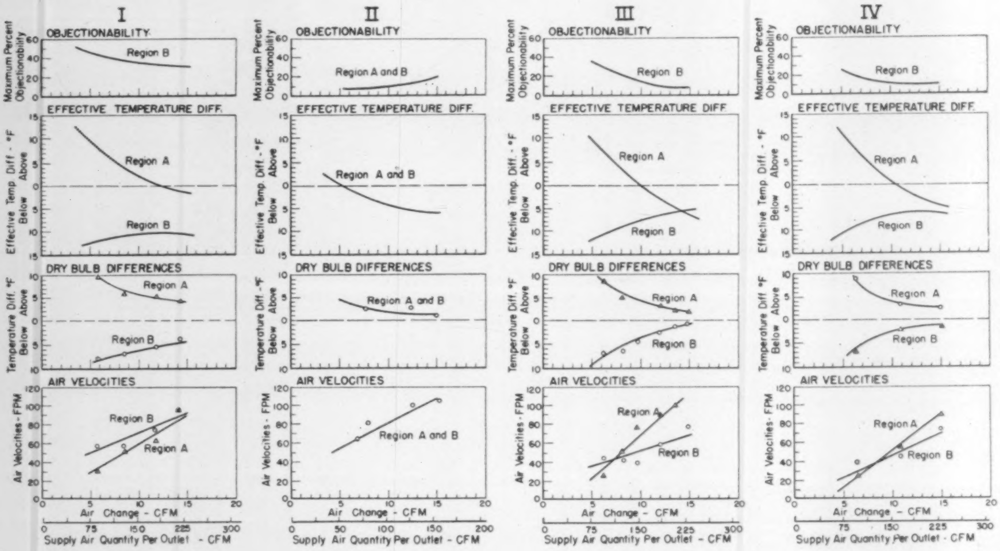

Fig. 4—Air and comfort conditions in critical draft regions A and B, Systems I to IV

After equilibrium had been obtained for each set of conditions, air distribution measurements were made on the grid. Since only the regions on the grid having critical draft conditions were considered important, these regions were located and probed with calibrated anemometers and temperature measuring instruments. This technique limited draft measurements in the room air flow pattern to the boundaries of the occupied zone where the draft would always be found to be the most objectionable.

In conjunction with the air temperature and air velocity measurements in the critical draft regions, the following data were obtained.

1. Surface temperatures on exposed walls, windows, ceiling and floor.
2. Register and return air temperatures and air flow rates.
3. Outdoor space temperatures.
4. Quantity and temperature of infiltration air.
5. Vertical air temperature gradients throughout the occupied zone.

Three returns were separately tested in order to determine the effect of return location on the air and temperature distribution.

Instruments

Anemometer measurements were made by several methods: (1) from angular deflections of calibrated, air movement-indicating threads (see Fig. 3); (2) by commercial heated-thermocouple anemometers; (3) by heated thermometer anemometer; (4) by heated thermocouple anemometer as developed by Nottage at the ASHAE Laboratory. All anemometers were calibrated in the minimum diameter section of a bellmouth intake nozzle. In addition, the calibration was checked on the discharge end of a converging nozzle mounted on a plenum.

Provisions were made to measure the floor-to-ceiling air-temperature gradients at various positions in the occupied zone by means of thermocouples on vertical poles. Both thermocouples and thermometers were used as temperature probes in the critical draft regions. Surface temperatures on the cold walls, windows,

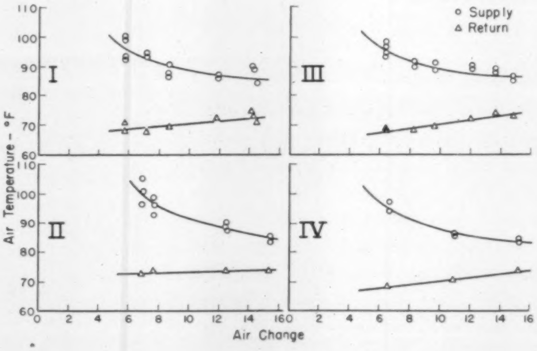

Fig. 5—Supply and return temperature as a function of air flow rate, for systems I to IV. 8 F outdoors, 73 F control

floor, and ceiling were measured by thermocouples attached flush to the surface.

Test Results

The results obtained from the tests for room heating are presented graphically to illustrate the general behavior of an air distribution system as brought out by the equations (see Appendix). These results apply when low returns are used except that high returns may also be used in system II.

The air velocities in the critical draft regions of the occupied zone plotted as a function of air flow rate or air change are shown in Fig. 4. Note the linear relationship between air change and air velocity in accordance with Equation A-1. Equation A-1 applies to a fixed point in the flow pattern whereas the experimental data apply to a region on the boundaries of the occupied zone covering an area of, say, 10 sq ft.

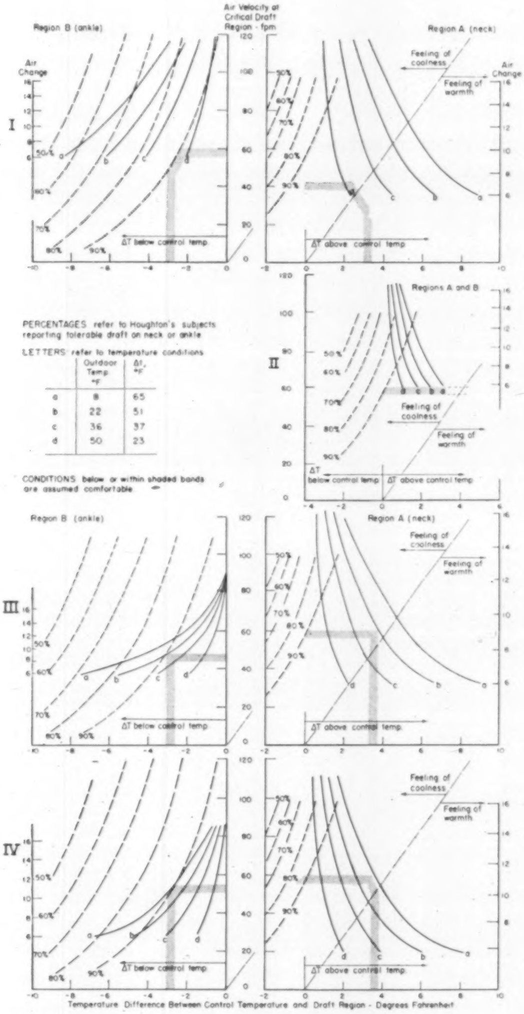

Fig. 6—Draft characteristics of Systems I to IV, various flow rates and outdoor temperatures

For a given room heat load, as the room-air velocities increase with air change, the air temperature differences in the critical draft regions with reference to the control temperature decrease according to Equation A-2 and as shown in Fig. 4.

The degree of draft in the critical draft region with respect to the control point and as measured by the effective temperature difference is plotted in Fig. 4. If the air temperature in the critical draft region is above the control point temperature, a *no draft* ($\theta = 0$) condition can be obtained. If the air temperature is below the control point temperature, a minimum draft condition (i.e. minimum θ) will result as shown in Fig. 4 and according to Equation A-8.

The probable percentage of occupants who would object to the draft in the critical draft region in accordance with Houghten's findings (see Terminology) is shown in Fig. 4. Note that the general trend of the objectionability curve is similar to the curve of effective temperature difference, as should be expected.

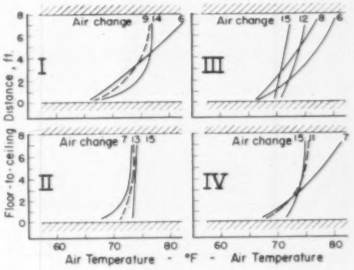

Fig. 7—Typical vertical air temperature gradients near the picture window, 8 F outdoors, various rates of air flow

In Fig. 5 are plotted the supply-air temperature and return air temperature as a function of air change.

In Fig. 6 are curves plotted in accordance with Equation A-2 in order to show the general behavior of draft in the critical draft regions. The air velocity is plotted against the air temperature difference for various indoor-outdoor temperature differences which is in effect for various values of Q_0 in Equation A-2. The curves apply to the critical draft regions, and superimposed on these are the curves of equal tolerability, so as to illustrate the probable reaction of occupants to the draft as the outdoor temperatures and air changes are varied for various systems of air distribution.

Typical vertical air temperature gradients in the region near the picture window are shown in Fig. 7. In Fig. 8 typical temperature differences between head and ankle levels are plotted versus the temperature differences between supply and return air. The curves are given for the air-distribution systems I to IV in accordance with Equation A-3. These curves apply to the region near the picture window as well as for any heating load and air change.

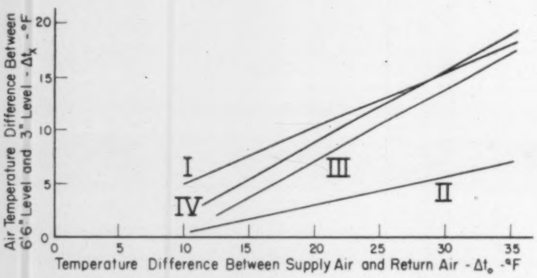

Fig. 8—Temperature differences 3 to 78 in. from floor, near picture window, any flow rate or outdoor temperature, Systems I to IV (see Equation A-3)

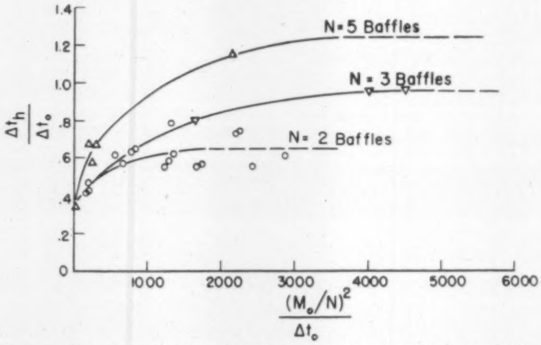

Fig. 9—Experimental results when using acoustical baffles, (see Equation 1)

When heating with perforated baffles, the number of baffles in use and their location (see Table 1) may influence the general air flow pattern in the space and as a result one would expect the constant *C* in Equation A-3 to depend on the number of baffles, *N*. In addition the relatively large size of a baffle and consequent low air velocity may magnify the buoyant effects and this complicates the simple relationship defined by Equation A-3. The effect of the number of baffles and buoyancy on the air temperature difference can be determined experimentally by evaluating the following general function which is just an extension of Equation A-3:

$$\Delta t/\Delta t_o = f\left[\frac{(M_o/N)^2}{\Delta t_o}, N\right] \quad \text{.........(1)}$$

where the ratio $(M_o/N)^2/\Delta t_o$ is proportional to the ratio of the momentum forces to the buoyant forces, evaluated at the outlet of the perforated baffles. In Fig. 9 the vertical air temperature difference measured near the picture window is plotted in accordance with Equation 1. Note that for a given number of baffles the ratio $\Delta t/\Delta t_o$ depends on $(M_o/N)^2/\Delta t_o$ only in the low range, (low momentum force and large buoyant force). For large values of $(M_o/N)^2/\Delta t_o$, the ratio $\Delta t/\Delta t_o$ appears to depend only on the number of baffles.

Preliminary tests on room cooling with perforated baffles showed room air temperature gradients which were appreciably smaller than those obtained for room heating with the same air supply temperature differences. This is primarily due to the fact that with a cooling load the warm air rising on the surface of the window mixes with the cold supply air before entering the occupied zone. With a heating load the cold air spilling down from the windows mixes with the supply air stream near the floor resulting in larger air temperature gradients. Baseboard diffusers will, of course, counteract this phenomenon.

The maximum permissible air quantity per baffle was found to be 130 cfm which produced an air velocity of 60 fpm directly under the baffles at the 6-ft, 2-in. level of the occupied zone.

Effect of Return Location on Air and Temperature Distribution

Each air-distribution system was tested with three different locations of the single return (see Table 1). For each system the return location was changed and the outdoor temperature maintained constant. The heat input was adjusted to maintain the same room control temperature for each run. (1) For the baseboard diffuser system there was no significant difference in gradient, return temperature, register temperature or heat input for any of these locations of the return. (2) With the high sidewall outlets at 12 air changes there was little difference between the two low returns but with the high return, the register temperature, return temperature and vertical air temperature gradients were all considerably higher. (3) With the acoustical baffles appreciable increases in vertical air temperature gradients were noted with the high return. (4) With the ceiling diffusers at 15 air changes there were no significant differences in vertical air temperature or air velocities between the three return locations. At a lower air change of 6 the two low-sidewall returns gave similar performanees, but with the high-sidewall return the supply temperature, return temperature and vertical air temperature gradients were all considerably higher.

In all tests, varying the return location did not affect the critical draft velocities appreciably. The effects caused by varying the return location can be attributed to *short-circuiting* of the warm air supply. If the distribution system produces small temperature gradients with floor returns the temperature of the air entering the return is relatively independent of the return location. If, however, the gradients are large with floor returns, mixing is incomplete and changing to a ceiling return will result in withdrawing air at a temperature above the normal room temperature. Since mixing is poor, (evidenced by the high gradient with floor returns), the withdrawing of the warm air near the ceiling will aggravate the situation, resulting in increased gradients, return temperature, register temperature and heat input.

Evaluation and Conclusions

The following conclusions apply to the type of installation under consideration *i.e.*, a high volume system for heating a typical living room in a well-insulated residence, and to the air distribution systems tested.

The theory predicted that the air velocities in the occupied zone would be proportional to the velocity at the supply outlets, and this was verified by all tests except those using perforated baffles for air supply. In other words, for the common types of registers, diffusers and baseboard slots used in residential heating, the *pattern* of air distribution is fixed by the geometry of the room and system, and the air *velocities* change with the volume of air circulated. For a given supply temperature the room air velocities vary with the indoor-outdoor temperature difference.

Combining these results with the existing information on the reaction of people to effective temperatures and drafts, it is possible to map the performance of four types of air distribution system for heating, over a wide range of outdoor temperatures and air supply rates, Fig. 6.

In Fig. 6 is also shown a shaded boundary outside of which the performance of each air distribution system is considered unsatisfactory and inside of which the performance is satisfactory.

The values used to define this boundary are based on the following criteria of evaluation:

1. Maximum allowable air movement in the occupied zone of 60 fpm.
2. 90 percent minimum tolerability or 10 percent maximum objectionability to the draft in the occupied zone.
3. Less than 7 deg vertical air temperature difference in the occupied zone between the 6-ft., 6-in. level and the 3-in. level. (Not over 3 deg temperature-difference between draft region B and control).

Actual air velocities and air temperatures produced by a system of air distribution were found by test measurements to approximate the general behavior described by the equations:

$V = C_1 M_o$ (see Fig. 4)
$Q_o = C_2 V \Delta t$ (see Fig. 6)
$\Delta t_o = C \Delta t$ (see Figs. 8 and 9 and Equation 1)

Journal Section

A system of air distribution can be evaluated on the basis of three factors: namely, vertical air temperature differences, air velocity, and the objectionability or tolerability of draft in the occupied zone (Fig. 6).

Acknowledgments

The authors gratefully acknowledge the generous financial support of this project by the General Electric Co. Weathertron Department, the F. W. Wakefield Brass Co., the American Society of Heating and Air-Conditioning Engineers, Inc., and Case Institute of Technology. We are indebted to Prof. L. G. Seigel and Harold Reed for supplying the performance data on the perforated acoustical baffles. The figures were prepared by Mrs. Ruth E. Strahosky.

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2. Air Distribution and Draft, by John Rydberg and Per Norback (ASHVE Transactions, Vol. 55, 1949, p. 225).
3. Computing Temperatures and Velocities in Vertical Jets of Hot or Cold Air, by Alfred Koestel (ASHVE Journal Section, *Heating, Piping & Air Conditioning*, June 1954, p. 143).

TERMINOLOGY

The following list explains the technical terminology pertaining to this paper:

1. *Occupied Zone*: The region in the test room which is enclosed by imaginary planes one foot from all walls and 6 ft, 2 in. from the floor is the occupied zone. In the test room the boundaries of the occupied zone were defined by a grid consisting of a string mesh made up into 6-in. squares. All draft measurements were limited to the plane of the grid, since the most objectionable draft conditions in the occupied zone would occur on the grid surfaces.

2. *Effective Temperature Difference*: The effective temperature difference is a quantitative measure of the difference in physiological feeling of warmth or coolness between two points within the test room. Normally, one of the two points is taken at a fixed reference point at the center of the room at the 30-in. level (referred to as the control temperature). An approximate equation defining the effective temperature difference, neglecting radiation and humidity, is:

$$\theta = \Delta t - 0.07V \text{ (Reference 2)}$$

where

θ = effective temperature difference between still air at control temperature and draft region.
Δt = dry-bulb temperature in draft region minus control temperature.
V = air velocity in draft region, feet per minute.

3. *Room Control Point*: The room control temperature is the dry-bulb temperature in the center of the test room at the 30-in. level. This temperature is measured by a shielded dry-bulb thermometer. This temperature was maintained as close to 73 F as was experimentally possible during all test runs.

4. *Draft*: The term *draft* in this report means any local sense of cooling or warmth of a portion of the body due to air movement and air temperature, humidity having been held constant. A measure of draft is the effective temperature difference. The warmth or coolness of a draft is usually measured in these tests above or below the room control conditions.

5. *Percentage Tolerability*: In predicting probable reaction of occupants to any of

these air distribution systems, Houghten's data on the tolerability of drafts is taken as the criteria (Reference 1). The percentage of his subjects who would not object if their necks or ankles were exposed to the draft condition measured in the test room is referred to as the *percentage tolerability* of that draft. The location of a draft was, of course, the determining factor in deciding whether it was the neck or the ankles which would most likely be affected by it, and in choosing one or the other of Houghten's sets of data accordingly. If the draft occurs within 6 in. of the floor surface, the ankles are taken as the reference region, and if the draft occurs some distance above the floor level, the neck is taken as the reference region.

6. *Percentage Objectionability*: The percentage objectionability of a draft is the opposite of its percentage tolerability (Reference 1). It indicates the percentage of people who *would* object to a measured draft condition, and it can therefore be found by subtracting the percentage tolerability from 100 percent. For example, on measuring a draft in the *neck region*, we might find that it would produce a skin temperature drop of 3.3 deg. We could then see from Houghten's figures that a probable 10 percent of the people experiencing this feeling of coolness on their necks would find it objectionable. Therefore, we would say that the measured draft had a percentage objectionability of 10 percent and a percentage tolerability of 90 percent.

7. *Critical Draft Regions*: The critical draft regions are regions in the occupied zone of the test room which might contain drafts of maximum objectionability with respect to the effective temperature experienced at the room-control temperature (still air at 73 F). The critical draft regions of the occupied zone will always be on the grid defining the boundaries of the occupied zone. In the five air distribution systems investigated, it was found that the critical draft regions in each system covered an appreciable grid area of at least 10 sq ft.

8. *Air Change* = cfm × 60/Room Volume in cubic feet.

Symbols

C = constants.
C_1 = constants.
C_2 = constants.
M_o = total air flow rate from all outlets, cubic feet per minute.
$(M_o)_m$ = air flow rate for minimum draft, cubic feet per minute.
N = number of perforated, acoustical baffles.
Q_o = register heat input, Btu per hour.
V = air velocity, feet per minute.
Δt = temperature difference, Fahrenheit.
Δt_h = vertical air temperature difference between the 6-ft, 6-in. level and the 3-in. level.
Δt_o = air temperature difference, supply to return, Fahrenheit.
θ = effective temperature difference, Fahrenheit (see Terminology).

APPENDIX

Theory and Analysis

A given system of air distribution will set up an air flow throughout the space, the *pattern* of which is, in general, almost independent of the air flow rate at the supply outlet. The *magnitudes* of the air velocities at the various points in the space can be considered a function of the supply air flow rate, and the vector *direction* of the air velocities (air flow pattern) at these various points can be considered a function of the type of air distribution system and the space configuration.

At any fixed point in an idealized free air jet, and for given outlet dimensions, jet theory predicts that the air velocity varies linearly with the outlet air flow rate if buoyant forces are neglected or,

$$V = C_1 M_o \text{ (see Reference 3) } \ldots \text{A-1}$$

Behavior of actual room air velocities can be expected to *approximate* Equation A-1 if the air distribution system and space configuration are fixed and inertia forces predominate. When heated or chilled air is introduced into the space, heat is transferred by convection and by mixing or entrainment from the air jet to the enclosing surfaces of the space. It may intuitively be expected that the heat flux in Btu per minute per unit area at given points throughout the air flow pattern should be proportional to the heat flow at the register outlet. This may be expressed simply as,

$$Q_o = 1.06\, M_o \Delta t_o = C_2 V \Delta t \ \ldots \text{A-2}$$

where the temperature difference Δt is arbitrarily measured with respect to some datum point, say the control temperature.

Combining Equations A-1 and A-2 and eliminating the jet velocity V, we have,

$$1.06\,(M_o \Delta t_o) = C_2 (C_1 M_o) \Delta t$$

or

$$\Delta t_o = C \Delta t \ \ldots\ldots\ldots\ldots\ldots\ldots \text{A-3}$$

Equation A-3 states that temperature differences in the air flow pattern depend only on the supply air temperature difference and are independent of air flow rate.

The effective temperature difference, θ, with respect to an arbitrarily selected control point at any fixed point in the air flow pattern can be considered:

$$\theta = \Delta t - 0.07V \text{ (Reference 2, see Terminology) } \ldots\ldots \text{A-4}$$

A measure of the tolerability or objectionability of draft can be established by assuming the percentages of Houghten's subjects[1] reporting tolerable or objectionable draft on the neck or ankle when subjected to various air temperatures and air velocities (see Terminology).

The temperature difference and air velocity Equations A-1 and A-3, can be substituted into the effective temperature difference Equation A-4 in order to obtain,

$$\theta = \Delta t_o / C - 0.07 C_1 M_o \ \ldots\ldots \text{A-5}$$

The room heating or cooling load can be expressed by,

$$Q_o = 1.06\, M_o \Delta t_o \text{ Btu per hr } \ldots \text{A-6}$$

combining Equations A-5 and A-6 we have,

$$\theta = (Q_o / 1.06 C M_o) - 0.07 C_1 M_o \ \ldots\ldots\ldots\ldots\ldots \text{A-7}$$

Equation A-7 brings out the fact that there may be a particular air flow rate which will result in minimum draft ($d\theta/dM_o = 0$) or in *no draft* ($\theta = 0$) as the case may be.

If the constants in Equation A-7 were determined from experiment, the air flow rate for minimum draft at a given point in the air flow pattern can be found by setting $d(\theta)/d(M_o) = 0$ as follows:

$$d\theta = [-Q_o d(M_o)/1.06 C M_o^2] - 0.07 C_1 d(M_o)$$

and

$$d\theta/dM_o = 0 = (Q/1.06 C M_o^2) - 0.07 C_1$$

$$(M_o)_m = \sqrt{\frac{-Q_o}{1.06 \times 0.07 c c_1}} \ \text{--------(A-8)}$$

Equation A-8 can be solved for the air flow rate, $(M_o)_m$, resulting in minimum room draft if the heating or cooling load is known, and if the constants C and C_1 for the region containing the most objectionable draft can be evaluated. Note that minimum draft values are obtained from Equation A-8 only if the constant C is negative, which means that Δt in Equation A-3 is the difference in air temperature measured below the control temperature.

THE PRESIDENT'S PAGE

Public Relations

PUBLIC relations is as old as mankind, and yet its importance to the proper functioning of all types of organizations has only been recognized during the past few years.

Since the science of public relations is comparatively new its purpose and its importance are not known nor appreciated by most people. Yet we all practice public relations in our everyday life.

Many definitions have been written, but perhaps the Public Relations Handbook has defined the whole function of public relations in a manner concise enough to guide any plan or program:

> Public relations is the management function which evaluates public attitudes, identifies the policies and procedures of an individual or organization with the public interest, and executes a program of action to earn public understanding and acceptance.

Our Society By-Laws define the responsibilities of the Public Relations Committee as:

> The Committee shall publicize the aims, activities and achievements, the scientific, and educational purposes of the Society, with the object of cultivating and stimulating public and members' interest in the Society and its affairs.

Our Society has recognized the importance of publicity for many years and has obtained important and valuable publicity in newspapers and in scientific and engineering journals. This has helped considerably, but the public and many of our own members still do not know and appreciate the purposes, activities, accomplishments, and future plans.

In order to improve this situation the Council discussed the subject of public relations at its meeting on January 24, 1954 and voted "That the Society should promote an active program of public relations". The Council also voted to employ a full time and experienced Director of Public Relations, which has been done. A program has been prepared, some parts of which have already been started. You will hear more about this in 1955.

However, the function of public relations is not limited to the Director of Public Relations and the Public Relations Committee. Every member and every chapter is a part of public relations. All members and chapters should share in the job of getting the essential facts about the Society across to the public: the services it renders, its activities, its accomplishments, and its value to the industry and the general public in advancing the arts and sciences of heating, ventilating, cooling and air conditioning.

Of what value are the Society's research, its technical papers, its development of new and improved information, codes and standards, and its many other activities unless the information is made available in usable form — and of still more importance — unless the industry and the public know that it is available and will accept it with confidence based upon a knowledge of the Society.

How can you help in this expanded and very important program of public relations? Here is a suggestion:

1. Keep yourself informed on the:
    - Purpose of the Society
    - Society's Research Program
    - Society's publications.
    - Value of chapter and Society meetings
    - Development of codes and standards
    - Other activities of the Society as they develop.

2. Be proud of your Society. It is a privilege to be a member of ASHAE. In your everyday contacts with other people, tell them about the Society's activities and its value to the industry and to the general public.

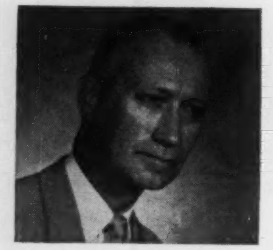
3. If you are a chapter member, show a real interest in the public relations activities of the chapter and assist in its public relations program. The "Manual for Chapter Operations" includes a section on chapter public relations activities and it is planned to revise this section so that more complete recommendations will assist the chapters in carrying out a realistic public relations program.

Public relations is a part of everything that we do, and unfortunately, the things that we don't do. Whether we realize it or not, we engage in public relations every day of our lives.

J. E. Haines

President

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS



Weather Data

By John Everetts, Jr.*, Philadelphia, Pa.

Weather data, in one form or another, influence the lives of most, if not all human beings on this earth.

There are two general types of weather data — meteorological data from which daily and long-range forecasts are made; and climatological data which is a compilation of a multitude of weather statistics which may be used, in part, to forecast, but, in the main, are used for specific analyses, probability forecasts and general information.

There are many fields in which weather data are of importance but this page is too small to include more than a brief resume on a few general categories.

Weather data are as important to agriculture as the development of markets for its products. Warnings of hail, frost and drought; the probability of cyclones, heavy rains and floods; the accurate prediction of the last frost in spring and the first frost in the fall have all, in time, prevented the loss of millions of dollars in basic foods as well as the financial ruin of many farm owners.

Research in conjunction with the TAC on Plant and Animal Husbandry is now being conducted to ascertain the most desirable temperature, humidity, solar radiation and air motion to increase the productivity of plants grown within enclosed spaces to avoid the uncertainties of the weather.

In the field of transportation it would be practicably impossible to operate without weather forecasts and a comprehensive analysis of weather data. The high safety record of the airlines is due in large part to accurate weather forecasting. Analysis of data and forecasts provide truckers and railroads with warnings against floods, blizzards, ice and storms. Shippers are forewarned of hurricanes, typhoons, fog and icebergs, and can predict within a few days, by analyzing past data, when the shorter North Atlantic route is too dangerous for safety, and thereby guide their vessels to the longer but safer routes to the south.

The construction industry would be a highly speculative and expensive venture were it not able, through the analysis of weather data, to predict the time and duration of rainy seasons, snowfalls, flood conditions of rivers and lakes, as well as potential water shortages caused by droughts. A road contractor must know the probable number of rainy non-productive days within a contract period just as the smart building contractor keeps careful check through weather data to minimize the cost of temporary heating and thus increase his profits.

Public utilities are at the mercy of the vagaries of the weather to a greater extent than most industries. So long as the weather remains "normal" they can predict the changes in electric, gas and steam loads with amazing accuracy. Trouble arises when the caprices of the weather produce "out-of-season" or "unpredicated" ice storms, floods, hurricanes, tornadoes, extreme rise and fall in temperatures and raging forest fires aided and abetted by continued drought.

The weather data required for the comfort of human beings are rather complex. In some cases data accumulated for the foregoing categories will suffice in part but may also be entirely different. Averages, means and normals are of little importance compared to extremes, duration of extremes and the simultaneous changes of combinations of two or more atmospheric variables. Dry bulb, wet bulb, solar radiation and wind movement all are important in making man comfortable whether he is outdoors or indoors. For the outdoor conditions affecting man's comfort meteorological forecasts tell him when to wear a topcoat, plan a trip to the shore for a swim, or even when it is a good time to buy a room cooler. For indoor comfort climatological data are used to design a system which in turn will produce such combinations of temperature, humidity and air motion as to satisfy his comfort requirements.

What are the weather requirements of the engineer designing heating and air conditioning systems? This is an important question and the answer is not simple because design engineers are people who consider their clients as important individuals occupying spaces of various types of construction in many different localities and who expect the maximum design of comfort for the minimum initial and operating costs.

As a result, the TAC on Weather Data formulated a program predicated upon a questionnaire sent to approximately 600 selected members of the Society. Over 200 answers were received and from these answers the Committee was able to establish a program which is now being activated.

The first step is a complete re-doing of the winter dry-bulb data. This will be presented to the Society members early this year for their criticism and, if possible, published in THE GUIDE 1956. These data will be followed up by summer dry-bulb and wet-bulb data, combination data, such as winter dry-bulb and wind; summer dry- and wet-bulb combinations and durations; combinations of temperature and solar radiation and many other sets of data in the order of priority established by the questionnaire.

While the components of all these data are in the climatological files of the Weather Bureau it is a tremendous task to separate them and place them in the order necessary to provide useful and usable information. There have been many attempts in the past to use short-cut methods which, in themselves, are mute evidence of the enormous job undertaken by this Committee. None of these abbreviated methods have met with acceptance by design engineers.

The air-conditioning industry, while approaching its mid-century mark, is still a young industry and is, therefore, fluid and flexible in its requirements which are continually changing. The same applies to weather data which must be kept abreast of the industry requirements. Your Committee will welcome suggestions and criticism and will do its humble best to satisfy your requirements so you, in turn, can more fully satisfy your clients.

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* Chairman, ASHAE Technical Advisory Committee on Weather Data.

Attend the Semi-Annual Meeting and Vacation in San Francisco

Aerial view of San Francisco with San Francisco — Oakland Bay Bridge

It's WESTWARD ho for Society members and their families this summer as they head for the Queen City of the Pacific and the 1955 Semi-Annual Meeting which will be held there June 27-29 at the St. Francis Hotel.

The Committee on Arrangements under the general chairmanship of S. W. Terry is planning an excellent program of special events, and the members of the Golden Gate Chapter are looking forward to welcoming everyone attending the Semi-Annual Meeting.

It is not too early to plan your Pacific Coast trip now and make it a vacation for the entire family. There is much to see and do in San Francisco from riding its noisy cable cars to visiting Telegraph Hill. It was from there, in the old days, that a semaphore signaled the approach of vessels coming through the Golden Gate from the ports of the seven seas.

Visitors will find San Francisco a city of friendly and courteous people, anxious to show the many sights of interest in their historic city. One of the beautiful views, so obvious it does not have to be pointed out, is the panoramic view of sea, bay and mountains. The city is built on 22 hills rising from the harbor, and each of them has a historical significance which can be learned while touring the city. San Francisco is a combination of modern buildings, the Old West, Chinatown, the Latin Quarter and many other ingredients which place this city in a distinctive class by itself.

In addition to attending the Semi-Annual Meeting and attempting to take in as much as possible of San Francisco, there are several social events planned by the committee which members will enjoy. On Monday afternoon a golf tournament will be held at the Lakeside Club in contests for the new Research Trophy, the Eichberg Memorial Cup and the Paul Bunyan Cup.

On Tuesday there will be a trip across Golden Gate Bridge for a visit to famed Muir Woods where one may stand in awe beneath towering redwoods, which are the oldest, largest living things in the world.

The banquet will be held on Wednesday evening, and the toastmaster will be B. M. Woods, past president of ASHAE and vice president, University Extension, University of California.

While staying in San Francisco some of the places to visit, in addition to those already mentioned, are famous Golden Gate Park, the Mission Dolores, Nob Hill, Twin Peaks and the Presidio. The city is a great shipping center, so be sure to visit the curved water front where one can see ships from the South Seas, the Orient, India, South America and many other parts of the world.

Then of course, while along the waterfront, be sure to go to the famous Fisherman's Wharf and visit the fine sea food restaurants.

Visiting San Francisco without going to Chinatown would be missing half the sight-seeing. As soon as you step into the narrow streets of Chinatown you will feel you have stepped into the world of the Far East. With over 200,000 inhabitants, San Francisco's Chinatown is the largest Chinese community outside of the Orient. Chinatown is growing, and its people are progressive, but because they maintain many of the ancient traditions and Chinese culture transplanted from their homeland it is filled with Oriental atmosphere. There are lantern-shaped lampposts, Chinese structures, pagodas and a shopping center never to be forgotten. Blocks of curio and art shops contain fine silks, hand-carved teakwood furniture, ivory, jade and rattan, while grocery and vegetable markets offer unusual Chinese foodstuffs. There are also famous restaurants and glamorous nightclubs presenting floor shows sparkling with Chinese talent.

Oklahoma City Awaits ASHAE April 14 Regional Meeting

OKLAHOMA CITY — a place to see, a place to be — is readying itself to welcome members of the Society to the Regional Meeting which will be held there April 14-16 in the Hotel Skirvin. The Committee on Arrangements under the general chairmanship of W. J. Collins, Jr., has planned an interesting and diversified program including a number of special events for the ladies. At the Saturday technical sessions several fine papers will be presented and E. R. Kaiser, ASHAE Director of Research, will tell the members about the latest activities of the Research Laboratory.

Friday, April 15, will be a leisurely day with informal golf in the morning and a get-together at 6:30 p.m. called the Oklahoma Roundup featuring a social hour, buffet supper and entertainment. The Regional Meeting will be concluded with a banquet on Saturday evening in the Persian Room of the Hotel Skirvin.

Today a city of some 243,504 population, Oklahoma City has undergone many growth changes since April 22, 1889 when the city was founded in a single day through the famous *Run of '89*. The site of the present city, a bare prairie that morning, was settled by over 10,000 inhabitants by nightfall. The capital of the state since 1910, Oklahoma City offers many interesting and historic places for you to visit while attending the meeting.

Committee on Arrangements Chairmen for ASHAE Regional Meeting, Oklahoma City, with Oklahoma Chapter President and Secretary: (*front*) Secy. F. R. Denham, E. W. Gray, Pres. G. E. Ervin, J. H. Carnahan, G. T. Donceel. (*rear*) J. R. Patten, F. X. Loeffler, Jr., A. C. Shelley, W. J. Collins, Jr., L. E. Wickline

Committee on Arrangements

W. J. Collins, Jr., General Chairman.

Finance: A. C. Shelley, chairman; R. R. Ellis, A. N. Hill, A. M. Hogan, W. R. Johnson, R. G. Keif, T. L. Robinson, A. H. Scott.

Ladies: L. E. Wickline, chairman; B. D. Foutz, C. O. Jensen, R. E. Swan.

Transportation: J. H. Carnahan, chairman; B. W. Clark, A. H. Lucas, H. E. Rountree, J. M. Samis, W. K. Smauder, R. E. Thomasson.

Entertainment and Banquet: F. X. Loeffler, Jr., chairman; W. W. Frankfurt, W. W. Kraft, H. R. Krueger, P. F. Oller, Jr., W. H. Stewart, R. L. Williams.

Publicity: E. W. Gray, chairman; W. V. Leftwich, W. T. Milam, J. E. Montin, A. R. Morin, C. M. York.

Registration and Reception: M. K. Cohenour, chairman; F. E. Dawson, Louis Loeffler, Jr., K. L. Sain, R. J. Stoll.

Sessions: J. R. Patten, chairman; T. J. Boyett, W. B. Loeffler, I. D. Nease, W. T. Ritter, Jr., D. B. Turkington, L. L. Von Tungeln.

PROGRAM — REGIONAL MEETING

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS

Hotel Skirvin **Oklahoma City, Okla.** **April 14-16, 1955**

Thursday — April 14

10:00 a.m. Executive Committee
1:30 p.m. Finance Committee
3:00 p.m. Chapters Conference Committee

Friday — April 15

9:30 a.m. Council Meeting (Regency Room)
10:30 a.m. Informal Golf at Lincoln Park
11:00 a.m. REGISTRATION (Mezzanine)
1:30 p.m. Sightseeing: Oklahoma City and TV Studio
4:00 p.m. Informal Chapters Conference Committee Meeting (East Room)
6:30 p.m. Oklahoma Roundup — Social Hour, Buffet Supper, Entertainment

Saturday — April 16

9:00 a.m. REGISTRATION (Mezzanine)
10:00 a.m. TECHNICAL SESSION (Crystal Room)
  Call to order by Pres. John E. Haines
  Report of the President
  Pressure Losses of Divided-Flow Fittings, by S. F. Gilman
  Panel Cooling for a Residence, by R. R. Irwin
12:30 p.m. Ladies Luncheon and Fashion Show
1:30 p.m. TECHNICAL SESSION (Crystal Room)
  What's New in ASHAE Research, E. R. Kaiser, Director of Research
  Weather Data Analysis for Cooling System Design, by G. V. Parmelee, G. E. Sullivan and A. N. Cerny
  An Analysis Method for Predicting Behavior of Solid Adsorbents in Solid Sorption Dehumidifiers, by W. L. Ross and E. R. McLaughlin
7:00 p.m. BANQUET (Persian Room)
  Toastmaster: Earle W. Gray
  Speaker: Tom Collins, Kansas City, Mo.
  Subject: Two and Two Aren't Always Four

THE GUIDE for 1955

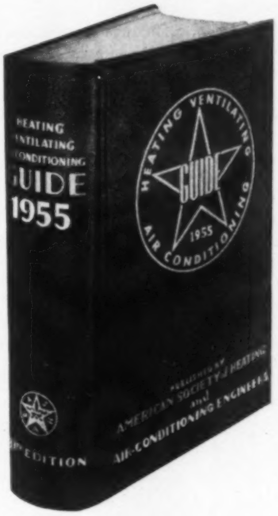
The 33rd Edition of this long-established reference and text — now available — brings the latest technical and equipment information abreast of current engineering practice.

HEATING, VENTILATING, AIR CONDITIONING GUIDE 1955, *33rd Edition, size 6 x 9, blue cloth bound, gold stamped*, AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, 62 *Worth Street, New York* 13, *N.Y., single copy price* $12.00.

THIS 33RD EDITION is both larger and improved in content. It has to be to keep current with the expanding technology of the profession. The technical section is presented in 1160 pages — more than in any other edition. At the same time the pages of the equipment section carry technical data concerning the products of 328 manufacturers.

The many revisions and expansions result from research work much of which is that of the research program of the Society; from changes in codes and standards; from the new methods in product design; from improved practices by engineers; from studies made by Technical Advisory Committees of the Society; and from the work of engineering committees of trade groups. Completion of the edition is thus the culmination of a cooperative effort by many members of the Society, all guided and co-ordinated by the Guide Committee made up of: R. E. Cherne, *chairman;* P. R. Achenbach, Albert Giannini, A. L. Hesselschwerdt, Jr., A. T. Jones, A. A. Marks, A. B. Newton, J. F. Sandfort, W. M. Wallace, II, R. S. Dill, *ex officio*, and Carl H. Flink, *technical secretary.*

Among the many improvements brought about are: (*a*) several chapters are entirely rewritten; (*b*) a new chapter on schoolhouse practices is included; (*c*) newly added information on heating systems using high temperature hot water; (*d*) newly organized design information on thermal conductivities and conductances for pipe insulation and building materials; (*e*) new winter design data for 66 Canadian cities; (*f*) new information on the cost of operating air-conditioning in residences; (*g*) an expanded reference list of the codes and standards currently in use; and (*h*) a rewritten chapter on district heating in accordance with *NDHA* recommendations for piping to pressure regulators and controls, with new illustrations for piping and for steam-carrying conduits.


HEATING
VENTILATING
AIR CONDITIONING
GUIDE
1955
HEATING VENTILATING AIR CONDITIONING
GUIDE
1955
PUBLISHED BY
AMERICAN SOCIETY OF HEATING
AND
AIR-CONDITIONING ENGINEERS
EDITION

In addition there are changes and revisions in many of the chapters such as the ones listed in the following paragraphs.

Chapter 8 — Air Contaminants: Tables of maximum allowable concentrations of toxic gases, vapors, dusts and fumes for occupied spaces revised to accord with latest data by the American Conference of Governmental Industrial Hygienists.

Chapter 10 — Moisture in Building Construction: The behavior of moisture in its transfer through wall sections is discussed and described, and a method is given for determining if condensation is likely to occur within a wall.

Chapter 16 — Heating Boilers, Furnaces, Space Heaters: The steel boiler rating tables are revised. Explanation of the use of the *SBI* rating codes is enlarged. Information on treatment of boiler water and care of idle boilers is improved.

Chapter 19 — Gravity Warm Air Systems: Tables of duct sizes and capacities and fitting illustrations are revised, and new and improved illustrations added.

Chapter 20 — Forced Warm Air Systems: Chapter largely rewritten to cover improvements and simplifications in system design, and selection of ducts, branches, and registers as adopted by the *National Warm Air Heating and Air Conditioning Association.*

Chapter 24 — Panel Heating: Directions for drying plaster panels and for starting panel systems are added as a result of studies by the ASHAE Technical Advisory Committee on Panel Heating and Cooling.

Chapter 27 — Pipe, Fittings, Welding: Enlarged by addition of newest *ASA* pipe fitting dimension data and revision of information on expansion, flexibility, and pipe hangers and supports.

Chapter 39 — Automatic Control: Sections on Unit Ventilator and Panel Heating Controls are improved.

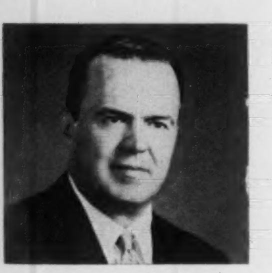
Chapter 40 — Motors and Motor Controls: Revised description and classification of motors. Improved diagrams of speed torque characteristics for squirrel cage and wound rotor motors. New information on acceptable starting methods for large motors.

Chapter 43 — Corrosion and Water Formed Deposits, Causes and Prevention: Largely rewritten with new data on methods of treating water to prevent scale formation and corrosion.

Chapter 46 — Industrial Exhaust Systems: Improved data on ventilation of metal cleaning and degreasing operations. References added on ventilation of kitchen hoods and cleaning tanks.

In spite of the many changes, the appearance, format and arrangement of chapters is kept and the 53 chapters are grouped in the following sections: I — Fundamentals, II — Human Reactions, III — Heating and Cooling Loads, IV — Combustion and Consumption of Fuels, V — Systems and Equipment, VI — Special Systems, and VII — Instruments and Codes.

Retained also are the useful edge indexes in both the Technical Data and the Catalog Data Sections, along with classified subject and product indexes. Still included is the highly useful 24- x 32-in. ASHAE Psychrometric Chart in two colors, use of which permits quick graphical solutions of many otherwise involved problems.


L. N. Hunter
President

ASHAE
61st Annual Meeting

A running account of Philadelphia program, including reports of Officers, Accountant and Committee on Research for 1954.

Next month there will be an account of the discussions which took place at the Technical Sessions.

J. E. Haines
President-Elect

FEATURED BY four technical sessions, the 61st Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS attracted one of the largest registrations ever, as announced by J. W. McElgin, general chairman, Committee on Arrangements. The 12th International Heating and Air-Conditioning Exposition broke records in attendance as well as in number of exhibitors. The program for ladies and social events were all outstanding successes. Attendance figures included: Members, 1389; Guests, 681; Ladies, 442. There was an international flavor to the Meeting with members present from Mexico, Australia, England, Belgium and with delegations of engineers from both Holland and West Germany.

First Technical Session, Monday, January 24, 9:30 a.m.

Pres. L. N. Hunter, Johnstown, Pa., opened the first technical session in the Clover Room of the Bellevue-Stratford Hotel and called upon L. M. Church, president of the Philadelphia Chapter, who outlined the features of the program planned by the members of the Philadelphia Chapter. He spoke, too, of the banquet on Wednesday night to be featured by the address of Dr. Milton S. Eisenhower, president, Pennsylvania State University. Mr. Church assured the visitors that the members of the Philadelphia Chapter would do their best to make all their guests welcome during their stay in Philadelphia.

As the next order of business, President Hunter presented his report covering many of the outstanding events during the past year.

Report of President

The year 1954 has been one of growth and improvement of the Society. Many of our problems have been those that are normal to any organization which is growing rapidly and which is part of an expanding industry.

Our Society's purpose is to advance the arts and sciences of heating, ventilating, cooling, and air conditioning. We accomplish this chiefly through the development of basic and fundamental technical data by research; through our publications and meetings where we disseminate and discuss the findings of our own research as well as those of others; and through our codes and standards in which we establish minimum requirements. Most of the other numerous activities of the Society are for the support of those I have just mentioned.

Research: Last summer, after more than a year of diligent searching, Council appointed a new director of research. This period of investigation was a difficult time for the members of the laboratory staff and I want to express my appreciation to C. M. Humphreys and the staff for their excellent cooperation during this trying period. In addition to their many engineering and research responsibilities, they helped to handle the administrative affairs at the Laboratory.

We feel that our Committee on Research is taking a realistic and long-range attitude toward the technical needs of our profession and we feel assured that Society research is going to contribute much toward the technical advancement of our profession and its allied industries. I am sure that 20 or 30 years from now members of our industry and profession will appreciate our efforts as we today applaud the foresight and judgment of those who developed and implemented our research program many years ago.

We must expand our research activities and we must find ways of financing the expanded program. An intensive fund-raising program is now being developed. The responsibility for fund-raising lies with the director of research and is under the jurisdiction of the Finance Committee.

Publications: Our publications represent one of our most important activities and involve many complex problems that are not readily understood by the average layman or engineer who has not had some experience in the publication field. Some of these problems are not easily resolved.

During this past year we have added to our staff an editor for our JOURNAL and TRANSACTIONS. We hope that the technical material appearing in our JOURNAL will become more readable and interesting and that the JOURNAL will contain a more complete coverage of Society news and information on Society activities and objectives.

I know that many of you have questioned from time to time the advisability of publishing TRANSACTIONS and sending a copy to every member. TRANSACTIONS is the only publication in which our technical papers together with their discussions appear in their entirety and is the only complete record of the Society's history and progress. The cost of publishing half the number of copies would be slightly less than the present cost because most of the expense is in the preparation of the manuscript and setting up the type.

THE GUIDE presents many publication problems which have been under study for several years. Some of these problems are getting so serious that some action will have to be taken on them in the near future. As the technology in our profession increases, the need for expanding the text also increases.

Meetings: The Society is becoming so large that, at present, Chicago and Philadelphia are the only two cities which have adequate exposition space and hotel facilities to accommodate our Annual Meeting when we have an Exposition at the same time. We expect that within the next two or three years there will be several more cities that will be able to accommodate us as a result of the addition of new hotels or exposition halls.

Those who arrange our programs are constantly wrestling with the problem of making them more stimulating and interesting. How can the quality of our programs be improved? Should they be more technical or less technical? Should we have simultaneous technical sessions covering different subjects and fields of interest? Many other technical societies have found it advisable to do this where there are sufficient papers available to permit more than one session at a time.

Next April there will be a Regional Meeting in Oklahoma City. If this meeting is successful we may continue to hold similar meetings in the spring and fall. These regional meetings will provide an opportunity for many members in a region to attend a Society meeting and they stimulate local interest in the Society.

When speaking of meetings we must not overlook the importance of the chapter meetings which serve a very useful purpose in advancing the Society's objectives. Every effort should be made to secure good speakers, to encourage attendance, and make the meetings of educational value.

Finances: The finances of the Society are in good condition. There are some who feel we should have a greater reserve, and this, of course, would be desirable. Several steps have been taken recently to increase our income. There has been an increase in the selling price of THE GUIDE to non-members and an increase in THE GUIDE advertising rates. The proposed by-law change, as it affects the distribution of the JOURNAL, will provide, if approved, additional income. Several other possible sources of income are under investigation.

It is most essential that we increase our income not only for an expanded research program but also for the support of other Society activities. Our costs are increasing each year and we could curtail services, but this is unthinkable. We are part of a vital and dynamic industry and we must have faith in its future. Our by-laws say we are to *advance* the arts and sciences of our profession. They do not say we merely are to preserve them or maintain a status quo. As our industry is becoming more technically complex, our responsibility toward our profession becomes greater.

Chapters: During this past two years I have had an opportunity to visit about 50 of our 59 chapters. This has been a very pleasant and inspiring experience. It is especially encouraging to find so many capable men in our chapters who will serve well and effectively in Society offices in the future. We are pleased to report that there seems to be an increased interest on the part of our members in the chapter activities in many localities.

We hope the day will come soon when we will have someone at the Society headquarters who can devote all of his time to chapter affairs. We are sure there will be a continued growth in the number of chapters and in chapter activities. By the end of 1945 we had only 36 chapters, whereas today we have 59.

A change in the present regional setup is under careful study and some recommendations will probably be forthcoming in the near future. The object of these changes is to assist the chapters in their operations and to maintain a closer relationship between chapter officers, the Society officers and headquarters.

Council will probably recommend that no more student branches be started. This action, if it is taken, will not be a precipitous one. It will be the result of a very detailed and exhaustive study of this problem that has been under way for several years.

Public Relations: A new public relations director has been added recently to our staff. We hope we can keep our growing membership and the public better informed on what we are doing and what we hope to accomplish.

Codes and Standards: The addition of personnel to our New York office staff will allow our Technical Secretary more time for work on Codes and Standards. Council has been striving for more activity on the part of the Society in this field for several years. Our Society can contribute much to the advancement of our profession through Codes and Standards, but the subject has become quite complex and complicated and requires the attention of experienced and well-informed personnel to resolve the many problems involved.

Headquarters: Because our Society is increasing in membership and in services to our members, we find we need more space for headquarters' operations. Some of you are aware of the fact that the founder societies which own the Engineering Societies' Building and which have long since outgrown it are looking for a new site where a new Engineering Societies' Center will be built to accommodate many of our technical societies. Your Council has expressed its intention to join with the other engineering societies in the plan to set up this Engineering Societies' Center. It is expected that some action will be taken by the founder societies on this matter within the next few weeks.

Awards: Our Society has not developed a specific or definite policy where the matter of awards is concerned, although the subject has been considered many times in the past and is still being studied. It is hoped that we can establish a definite philosophy on this subject in the near future and we will be guided by the experience of other technical societies in handling their awards. We can then give some advice and guidance to those who are considering offering or establishing awards in our society.

Membership: We now have 9920 members as compared with 7710 in 1950 and 3147 in 1940. We believe our membership will continue to grow at a rapid rate for several years as our industry expands.

Our Charter and By-Laws Committee is studying our membership classifications now and may recommend some changes in the names of one or more of our present classifications in order that we may conform to the standards recommended by the Engineers Council for Professional Development, which many other technical societies have already adopted. This will not mean a relaxing of our membership qualifications. It is expected also that a Fellow grade will be added so that we may be able to give recognition to those of our members of unusual engineering accomplishment.

Long-Range Plans: One of the most progressive steps the Society has taken in recent years was the appointment of a Long-Range Planning Committee in 1953. This Committee has done an excellent job for the Society and the members have worked very diligently making detailed studies of many of the Society's affairs from a long-range standpoint and have made a number of very constructive recommendations.

Relationship To Other Professional Societies: As President, I have had an opportunity to attend the meetings of several other professional societies. It is interesting to note that most organizations like ours are faced with the very same problems.

Our executive secretary keeps in touch with the secretaries of other societies through the Council of Engineering Society Secretaries where an opportunity is provided to discuss matters of mutual interest pertaining to the administration of societies and to exchange ideas.

During the past year we have been working very closely with the *American Society of Refrigerating Engineers* through a joint committee. The purpose of this committee is to work out plans for closer cooperation between the two societies, particularly in those fields where their functions and interests overlap. This committee has made a number of constructive recommendations.

Name Change: One important action taken by the membership this past year was changing the name of the Society to AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, INC. This in no way changes our purpose and we will continue to promote all of the objectives provided for in our Charter. Printed material and letterheads of the Society will be changed to the new name with as little change as possible in the format. The Society emblem will follow the same pattern with the "V" changed to an "A". The letter designation of the Society will be ASHAE instead of ASHVE.

In closing, I wish to express my appreciation to the other officers, members of Council, and various committees who have done so much to further the purposes of our Society. I also want to thank the chapter officers and our members for their contributions of time and experience to the Society. Our loyal staff deserves the sincerest praise and highest commendation for the whole-hearted cooperation and valuable guidance and effective service, for without them much of our work would be in vain.

It has been a real pleasure and privilege to serve you.

Respectfully submitted,
L. N. Hunter, *President*

Report of Treasurer

Treas. E. R. Queer, State College, Pa., following his introduction by President Hunter, summarized interesting and important figures from the Accountants' Report, making use of several slides. He pointed out also that the proposed budget for 1955 is increased largely because of the anticipated expansion in the work of the Research Laboratory.

A. V. Hutchinson, executive secretary, New York, N. Y., presented the Report of Council:

Journal Section

Accountants' Report

Frank G. Tusa & Co.
CERTIFIED PUBLIC ACCOUNTANTS
37 Wall St., New York 5, N. Y.

AMERICAN SOCIETY OF HEATING AND
AIR-CONDITIONING ENGINEERS, INC.
62 Worth Street
New York, N. Y.

Gentlemen:

Pursuant to your request, we examined the books of account and records of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, INC. — New York, N. Y. and Cleveland and its related funds for the fiscal year ended October 31, 1954 and submit herewith our report.

The audit covered a verification of the Assets and Liabilities as of the close of business October 31, 1954. For the fiscal year then ended, the recorded cash receipts were traced into the depositories; the cancelled bank checks were inspected and compared with the record of cash disbursements, and the disbursements were supported by payment vouchers. The dues from members and the interest from investments were accounted for.

A Balance Sheet reflecting the financial condition of the Society as of the close of business October 31, 1954 is submitted herewith and your attention is directed to the following comments thereon:

CASH

The Cash on Deposit was verified by direct communication with commercial and savings banks and the balances reported to us were reconciled with those reflected by the books of the Society. A schedule of cash is included as a part of this report.

Checks representing the cash on hand for deposit were inspected by us and the cash on hand was counted.

MARKETABLE SECURITIES

The securities shown on the subjoined schedule were verified by direct communication with the Bankers Trust Company, where same are deposited for safe-keeping. Securities have been included in the accompanying balance sheet at the cost of acquisition plus the accumulated and accrued interest earned thereon.

ACCOUNTS RECEIVABLE

Trial balances taken of the membership dues receivable and sundry debtors as of the close of business October 31, 1954 were classified and aged as follows:

MEMBERSHIP	1954
Members	$ 4,324.23
Associates	3,993.50
Affiliates	4,154.25
Juniors	2,333.32
Students	12.00
TOTAL	$14,817.30

SUNDRY DEBTORS	
Unpaid charges made during 1954	$ 3,926.27
Unpaid charges made during 1953	228.29
TOTAL	$ 4,154.56

After writing off all receivables known to be uncollectible, it is our opinion that reserves for dues and accounts receivable doubtful of collection reflected in the accompanying Balance Sheet are ample to cover collection losses that may be incurred.

RESEARCH FUND ACCOUNTS RECEIVABLE

The balance due to the Research Fund from the Society as at October 31, 1954 represents the unpaid balance of 40% of the dues receivable from members, associates, and affiliates as of such date.

INVENTORIES

The following inventories were verified either by physical count or direct communication.

TRANSACTIONS	$7,989.59
EMBLEMS	398.14
GUIDE PAPER	915.69
MEMBERSHIP ROLL PAPER	200.00
TOTAL	$9,503.42

A schedule of TRANSACTIONS inventories follows:

VOLUME	YEAR	QUANTITY	PRICE	AMOUNT
1-53	1895-1947	4,151	$ .40	$1,660.40
54	1948	783	1.78	1,393.74
55	1949	272	2.02	549.44
56	1950	691	2.08	1,437.28
57	1951	702	2.275	1,597.05
58	1952	145	1.796	260.42
59	1953	544	2.006	1,091.26
TOTAL				$7,989.59

DEPOSITS RECEIVABLE

The deposit placed with the United Airlines in the sum of $425.00 was verified by direct communication.

ADVANCES

The indebtedness from employees in New York and Cleveland represents advances to the employees retirement plan in the sums of $3,643.46 and $1,331.41 respectively.

DEFERRED CHARGES

The following prepayments have been deferred to future operations:

HPAC Subscriptions	$3,207.93
Insurance Premiums — Cleveland	440.05
Insurance Premiums — New York	534.09
TOTAL	$4,182.07

PERMANENT ASSETS

The Land and Buildings, Instruments, Equipment and Furniture and Fixtures are reflected on the Balance Sheet at cost of acquisition. With the exception of land and buildings all assets have been depreciated at the rate of 10% per annum. During the year fully depreciated Furniture and Fixtures in the amount of $55.30 was written off against the reserve.

In accordance with the resolution adopted by the council at its meeting of January 23, 1949 depreciation was not provided on the Buildings for the current fiscal year.

DEFERRED INCOME

The prepaid dues and initiation fees by members and candidates for membership have been deferred to future operations. The membership classification of the dues prepaid by elected members follows:

MEMBERSHIP	AMOUNT
Members	$ 756.90
Associates	59.62
Affiliates	315.25
Juniors	461.57
Students	23.50
TOTAL	$1,616.84

RESERVE FOR TRANSACTIONS

Out of the original $14,000.00 provided for TRANSACTIONS Volume 59 there remains an unexpended balance of $13,962.43 which is reflected in the accompanying Balance Sheet.

RESERVE FOR BUILDING MAINTENANCE

On October 31, 1952 the Council voted:

> "That disbursements be made from the Building and Maintenance Reserve Fund as authorized by the Building Committee for major items of repair and maintenance, but any balance remaining in the fund beyond the expenditures for each year would go into reserve until the Building Maintenance Reserve Fund reached a total of $10,000.00."

The fund had a $4,000.00 balance as at the beginning of the fiscal year. An additional $2,000.00 was provided in the budget for the current year. During the year the following major repairs were made from proceeds withdrawn from this fund:

Gutter repair, Office roof	$ 723.00
New roof, Laboratory	898.00
Painting, one coat, office	641.00
TOTAL	$2,262.00

Inasmuch as Council (Oct. 8) authorized expenditures for laboratory repairs, the foregoing expenditures were made from the Reserve for Building Maintenance Fund, and are not reflected in the Statement of Income and Expenses of the Society. As at the end of the current fiscal year, the Building Maintenance Reserve Fund had an unexpended Balance of $3,738.00.

FUNDS

There is included as a part of this report an analysis of Funds reflecting the changes that occurred therein during the fiscal year ended October 31, 1954.

INSURANCE

The insurance coverage of the Society follows:

INSURANCE (*continued*)		
FIRE		
Building (Cleveland)		$201,000.00
Personal Property:		
Cleveland	$104,000.00	
New York	25,500.00	
Printers	12,000.00	141,500.00
SPRINKLER LEAKAGE		
Waverly Press	10,000.00	
Hawes and Petit	2,000.00	12,000.00
NON-OWNERSHIP — AUTOMOBILE — COMPREHENSIVE		
Public Liability		100/300M
Property Damage		25M
Medical		1M
GENERAL PUBLIC LIABILITY — PREMISES		
New York and Cleveland		
Liability		100/300M
Bodily Injury		25/100M
COMMERCIAL BLANKET BOND		
All employees including the President, Treasurer and Chairman of the Finance Committee		20,000.00

Respectfully submitted,
FRANK G. TUSA & CO.
CERTIFIED PUBLIC ACCOUNTANTS

BALANCE SHEET

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, INC. — New York, N. Y.
October 31, 1954

ASSETS

GENERAL FUNDS			
SOCIETY ASSETS			
Per Schedule Attached			$ 77,221.12
RESEARCH ASSETS			
Per Schedule Attached			61,230.32
PROPERTY FUND			
Land and Buildings	$84,920.96		
Less: Reserve for Depreciation	3,908.07	$81,012.89	
Laboratory and Equipment	70,156.49		
Less: Reserve for Depreciation	40,016.32	30,140.17	
Furniture and Fixtures (N.Y.)	17,869.79		
Less: Reserve for Depreciation	6,415.64	11,454.15	
Library (Cleveland)		300.00	
Tools (Cleveland)		300.00	123,207.21
BUILDING FUND			
CASH ON DEPOSIT		851.24	
SECURITIES			
At Cost (Market Value $37,533.40)	34,304.00		
Add: Accumulated Interest	3,191.90	37,495.90	38,347.14
BUILDING MAINTENANCE RESERVE FUND			
Cash on Deposit		3,600.00	
Due from Research General Fund		138.00	3,738.00
SOCIETY RESERVE FUND			
Cash on Deposit		18,444.29	
Securities at Cost (Market Value $89,204.85)	86,346.50		
Add: Accumulated Interest	2,858.35	89,204.85	107,649.14
ENDOWMENT FUND			
F. PAUL ANDERSON FUND			
Cash on Deposit		257.29	
Securities at Cost (Market Value $979.00)	1,000.00		
Add: Accrued Interest	12.50	1,012.50	1,269.79
RESEARCH FUND			
Cash on Deposit			740.03
RESEARCH RESERVE FUND			
Cash on Deposit			13,102.65
TOTAL ASSETS			$426,505.40

LIABILITIES

GENERAL FUND			
FEDERAL WITHHOLDING TAXES		$ 1,698.00	
DUE RESEARCH GENERAL FUND		3,727.70	
ACCRUED ACCOUNTS			
Salaries and Commissions	$12,023.73		
Professional Fees	1,000.00	13,023.73	
SUNDRY ACCOUNT PAYABLE		100.00	
DEFERRED INCOME			
Prepaid Membership Dues			
Elected Members $1,616.84			
Candidates 978.25	2,595.09		
Prepaid Admission Fees	2,239.75	4,834.84	
RESERVE FOR PUBLICATIONS			
Transactions — Volume 59		13,962.43	
RESERVE FOR FLUCTUATION IN CANADIAN EXCHANGE		71.23	$ 37,417.93
RESEARCH FUND			
Sundry Accounts Payable	116.15		
Due to Building Maintenance Reserve Fund	138.00	254.15	
DEFERRED INCOME			
Unexpended Earmarked Contributions		18,153.43	18,407.58

NET WORTH

Society General Fund	39,803.19	
Research General Fund	42,822.74	
Property Fund	123,207.21	
Building Fund	38,347.14	
Building Maintenance Reserve Fund	3,738.00	
Society Reserve Fund	107;649.14	
F. Paul Anderson Fund	1,269.79	
Research Endowment Fund	740.03	
Research Reserve Fund	13,102.65	370,679.89
TOTAL LIABILITIES AND NET WORTH		$426,505.40

COMPARATIVE STATEMENT OF INCOME AND EXPENSES

AMERICAN SOCIETY OF HEATING AND
AIR-CONDITIONING ENGINEERS, INC. — NEW YORK, N. Y.
For the fiscal years ended October 31, 1954 and October 31, 1953

	FISCAL YEAR ENDED		
	OCTOBER 31, 1954	OCTOBER 31, 1953	INCREASE (DECREASE)
INCOME			
Income from Dues	$133,756.91	$123,800.89	$ 9,956.02
Admission Fees	8,429.50	9,690.00	(1,260.50)
Emblems, Pins, Etc.	819.75	1,172.00	(352.25)
PUBLICATIONS			
JOURNAL Contracts	23,500.00	23,500.00	-0-
GUIDE	144,845.24	132,973.58	11,871.66
TRANSACTIONS	1,473.83	3,158.79	(1,684.96)
Books, Reprints, Codes, Etc.	2,026.57	3,446.80	(1,420.23)
Income from Investments	1,282.89	927.09	355.80
RESEARCH			
Dues	69,784.26	64,381.43	5,402.83
U.S. Navy Research	13,340.89	34,798.45	(21,457.56)
Contributions — General	19,393.32	17,535.37	1,857.95
Contributions — Earmarked	41,079.96	29,852.00	11,227.96
Interest	43.87	39.26	4.61
TOTAL INCOME	$459,776.99	$445,275.66	$14,501.33
EXPENSES			
Committees and Chapters	$ 24,818.44	$ 20,995.59	$ 3,822.85
Meetings	5,881.86	5,923.53	(41.67)

Journal Section

PUBLICATIONS			
Members Subscriptions to HPAC	18,139.37	16,618.29	1,521.08
TRANSACTIONS	17,699.65	21,737.45	(4,037.80)
Membership Roll	2,236.22	2,918.57	(682.35)
Books, Reprints, Codes, Etc.	2,557.58	2,510.91	46.67
GUIDE	87,217.15	83,128.64	4,088.51
Headquarters	143,375.21	128,687.05	14,688.16
Fund Raising	10,780.01	11,551.07	(771.06)
RESEARCH			
Committee Expenses	4,915.63	4,210.46	705.17
Staff Salaries	76,849.90	75,411.51	1,438.39
Laboratory Expenses	20,951.41	18,340.33	2,611.08
Building Operation and Maintenance	9,463.39	9,454.06	9.33
Provision for Building Maintenance Reserve	2,000.00	2,000.00	-0-
U.S. Navy Research	9,851.30	24,834.26	(14,982.96)
Cooperative Research	33,165.59	22,025.66	11,139.93
Other Deductions	5,261.43	16,391.93*	(11,130.50)
TOTAL EXPENSES	475,164.14	466,739.31	8,424.83
EXCESS OF EXPENSES OVER INCOME	$ 15,387.15	$ 21,463.65	$ 6,076.50

*Other deductions for fiscal year ended October 31, 1953 included $9,690.00 in Admission Fees allocated to Reserve Fund.

Report of Council

The organization meeting of the Council was held on January 28, 1954 and four regular meetings and two special meetings were held during the year.

Appointments of Committees were made in accordance with the By-Laws of the Society. A one-year vacancy on Council was filled by appointment of B. W. Farnes, Portland, Ore. and a vacancy on the Committee on Research was filled by appointment of F. K. Hick, M.D., Chicago, Ill.

A new Director of Research was appointed and E. R. Kaiser assumed his new duties in the middle of August.

Approval was given for having By-Laws drafted so that membership requirements would conform to suggested ECPD recommendations.

Council proposed a change of name for the Society to include the words, *air conditioning*, and this was adopted at a special meeting in New York on November 22. The new name, AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, INC., was filed with the Secretary of State of the State of New York, was officially approved and became effective December 8, 1954.

After a publication survey authorized by Council, it was concluded that a change in method of publishing the monthly JOURNAL would be advisable so that all members could subscribe for the magazine directly to the publisher and, in order to do so, a special meeting of the Society was called for January 22 at Philadelphia to vote on a necessary By-Law change.

As required by Section 46 of the Membership Corporations' Law of the State of New York the following report is presented by the Council and filed herewith:

Assets

The Society has the following Assets:

Land and Laboratory Buildings at Cleveland, Ohio	$81,012.89
Furniture and Equipment, Tools, etc., at New York and Cleveland	42,194.32
On deposit in New York and Cleveland banks	138,764.73
Securities (United States and Utility Bonds) with Bankers Trust Co., New York as custodian	131,523.11
Accounts Receivable	13,924.99
Inventory Items	9,503.42
Deferred Items	4,182.07
Miscellaneous	1,534.17
Total	$422,639.70
1953 TOTAL	420,075.86
Increase	$ 2,563.84

The Sources of Society Cash Receipts were:

Admission Fees and Dues	$143,006.16
Publications	171,845.64
Interest	1,282.89
From Research	143,642.30
TOTAL	$459,776.99

Cash Disbursements were:

Meetings, Committees and Chapters	$ 30,700.30
Publications	127,849.97
Headquarters	143,375.21
Fund Raising	10,780.01
Research	159,106.76
TOTAL	$471,812.25

The Society's Reserve Fund was increased by the addition of $8,429.50 Admission Fees and $2,527.62 Interest earned on Savings Bank Accounts and Securities. This is an increase of $10,957.12 bringing the Reserve Fund to $107,649.14.

Now in the Custodian Account of the Bankers Trust Co., New York, there are securities of the United States and Canadian Governments and a utility which cost: General Fund $3,782.36; Building Fund $34,304.00; Reserve Fund $86,346.50; and F. Paul Anderson Fund $1,000.00. The Research Reserve Fund now amounts to $13,102.65.

Liabilities

The Society has the following Liabilities:

Accounts Payable	$ 216.15
Federal Withholding Taxes	1,698.00
Accrued Accounts	13,023.73
Deferred Income:	
Research Projects	18,153.43
Prepaid Dues, Initiation Fees, etc.	4,834.84
Reserve for	
TRANSACTIONS	13,962.43
Fluctuation in Canadian Exchange	71.23
Net Worth (Funds)	370,679.89
TOTAL	$422,639.70

At the end of the fiscal year, October 31, 1954, the Balance Sheet shows the Society's Net Worth as $370,679.89 compared to $381,955.09 on October 31, 1953, a net loss of $11,275.20.

The insurance coverage of the Society is as follows: Fire for Buildings $201,000.00; for Contents $141,500.00; Sprinkler $12,000.00; Automobile Comprehensive Public Liability $100,000-300,000.00; Property Damage $25,000.00; Medical Payments $1,000.00; Bodily Injury $25,000-100,000.00; Fidelity Bonds on Officers and all Employees $20,000.00. Workmen's Compensation is carried in New York and Ohio as required by law.

The Society has contributed to the Employees Retirement Plan Trust $2,129.85 and the participating employees contributed a similar amount deducted from salary.

Total cash in New York and Cleveland banks $138,764.73; consisting of $46,550.97 in General Operating Fund, $18,444.29 in Reserve Fund, $257.29 in F. Paul Anderson Fund, $55,218.26 in the Research General Fund, $13,102.65 in Research Reserve, $740.03 in Research Endowment, $3,600.00 in Building Maintenance Reserve Fund and $851.24 in the Building Fund.

Membership

The Society admitted the following members in the grades indicated since January 1, 1954:

Members	367
Associates	15
Affiliates	341
Junior Members	318
Students	106
TOTAL	1,147

The names and addresses of the candidates for membership were published in the JOURNAL of the Society each month during the year and are on record in the Secretary's office. The present membership total is 9,920.

Respectfully submitted,
L. N. Hunter, *President*
E. R. Queer, *Treasurer*

President Hunter stated that the next order of business was to give attention to two proposed amendments to the By-Laws of the Society.

The first of these is an amendment to **Article VII,** *Section* 3 (*h*), on which the members had been given notification at the Swampscott Meeting and President Hunter called for a motion on this proposed change. John Everetts, Jr., Philadelphia, Pa., moved that the proposed change in **Article VII,** *Section* 3 (*h*), paragraph 5 of the By-Laws be adopted and this was seconded by A. W. Edwards, Cincinnati, Ohio.

President Hunter then read the proposed By-Law change which is as follows:

> The Committee on Research shall recommend to the Council for appointment a Director of Research whose activities, proceedings and reports shall be subject to the direction of the Committee and the approval of the Council. The salary of the Director of Research shall be fixed by the Council upon the recommendation of the Committee on Research, and his employment may be terminated in the Council's discretion.

Since there were no objections to a vote by a show of hands, the motion was put to a vote using that method and was unanimously adopted.

President Hunter then drew attention to the second By-Law change which pertains to **Article IV,** *Section* 4 of the By-Laws, and having to do with Journal subscriptions. Notification to the membership concerning this proposed change had been covered by calling a special meeting of the Society on Saturday, January 22, 1955 at 2:00 p.m. at the Bellevue-Stratford Hotel in Philadelphia.

President Hunter stated that the proposed amendment to **Article IV,** *Section* 4 reads:

> Members of all grades, except Students and dues paying members whose pro-rated dues amount to less than $10.00, shall be entitled to receive the Society's Transactions and Guide.

Second Vice Pres. John W. James, Chicago, Ill., moved the adoption of this By-Law change and the motion was seconded by Mr. Everetts.

Following the discussion of the motion, a vote by secret ballot was taken. President Hunter appointed A. W. Edwards as chairman of a teller's committee to serve with R. T. Kern, Fitchburg, Mass., J. S. Locke, Minneapolis, Minn., and R. S. Dill, Washington, D. C.

When the tellers completed their count, President Hunter announced that the motion had carried by a vote of 116 for the motion and 35 against, constituting more than a 2/3 majority.

At this time, President Hunter called on John Everetts, Jr., vice-chairman of the Philadelphia Committee on Arrangements, who announced various items concerning details of the program following which E. K. Wagner, chairman of the Entertainment Committee, made announcements concerning the entertainment features of the program.

President Hunter introduced E. F. Snyder, Jr., Minneapolis, Minn. as chairman of the first technical session.

Chairman Snyder read the rules covering the professional sessions, and ruled, that because of time limitations, it would be necessary to keep time allowances for speakers within careful limits.

He then introduced C. P. Yaglou, Boston, Mass., who presented his paper, Ventilation Requirements for Cigarette Smoke (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning,* January 1955, pp. 227-230).

No written discussions having been received on the paper, Chairman Snyder asked for discussions from the floor and Lester T. Avery, Cleveland, Ohio, asked to be informed at what point air was brought into and exhausted from the test rooms under discussion. Mr. Avery was of the opinion that this made a considerable difference and felt that it was best to bring air in from the bottom and exhaust from the top. Professor Yaglou replied, stating that the air handling was just the opposite since air was introduced through a perforated ceiling and exhausted from a lower part of the rooms.

At this time, Chairman Snyder introduced K. T. Whitby, Minneapolis, Minn. who presented his paper, A Rapid General Purpose Centrifuge Sedimentation Method for Measurement of Size Distribution of Small Particles, Part I — Apparatus and Method (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning,* January 1955, pp. 231-237).

W. C. L. Hemeon, Pittsburgh, Pa., W. A. Crandall, New York, N. Y., B. L. Evans, St. Louis, Mo., Stig Sylvan, Louisville, Ky., presented written discussions which they had prepared on this subject. R. S. Farr, Los Angeles, Calif., and C. S. Leopold, Philadelphia, Pa., discussed the paper from the floor. Following this, the author closed the discussion by pointing out, among other things, that when Part II of his paper is published, it will carry considerable information which will further describe the method and give additional data concerning its use.

Chairman Snyder then introduced W. T. Van Orman, Akron, Ohio, who presented the paper, Evaluation of Panel Type Air Cleaners by Means of Atmospheric Dust, by H. A. Endres, W. T. Van Orman and R. P. Carter, Jr. (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning,* December 1954, pp. 127-133).

Written discussions concerning various phases of this paper had been prepared by Leslie Silverman and D. M. Anderson, Boston, Mass.; K. T. Whitby and A. B. Algren, Minneapolis, Minn.; R. S. Farr, Los Angeles, Calif.; G. F. Landgraf, McKees Rocks, Pa.; Arthur Nutting, Louisville, Ky.; B. L. Evans, St. Louis, Mo.; G. W. Penney, Pittsburgh, Pa.; W. K. Gregory, Louisville, Ky.; Lester T. Avery, Cleveland, Ohio; W. C. L. Hemeon, Pittsburgh, Pa.; J. W. Frazier, Louisville, Ky.; W. B. Watterson, Cleveland, Ohio; C. B. Rowe, Madison, Wis.; M. E. Jacoby, Newark, Ohio; and L. L. Dollinger, Jr., Rochester, N. Y.

Chairman Snyder pointed out that, because of the unusually large volume of the written discussions received, it would be impossible to have all of them presented in full. As rather extended discussions had been received at an early date from Dr. Whitby and Professor Algren, as well as from Dr. Silverman and Mr. Anderson, Chairman Snyder felt that these discussers should be called upon first. As a result Dr. Whitby presented the written discussion prepared by him and Professor Algren, following which Dr. Silverman presented his written discussion which he prepared with Mr. Anderson.

Then Chairman Snyder suggested that the author, Mr. Van Orman, close the discussion on the paper. The Chairman also indicated that discussions would be printed later either in abstract or in full.

Chairman Snyder turned the meeting over to President Hunter, who called for adjournment at 12:00 noon.

Second Technical Session, Tuesday January 25, 9:30 a.m.

First Vice Pres. John E. Haines opened the second technical session in the Ballroom of the Bellevue-Stratford Hotel and introduced R. S. Dill, chairman of the Committee on Research, who thereupon presided over the session. Chairman Dill read the rules for professional sessions and presented the Annual Report of the Committee on Research 1954. The Report of this Committee together with the Report of the Director of Research appears on page 171 of this issue of the Journal.

Chairman Dill introduced L. F. Schutrum, Cleveland, Ohio, who presented the paper, Preliminary Studies of Heat Removål by a Cooled Ceiling Panel, by L. F. Schutrum, John

Vouris and T. C. Min (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, January 1955, pp. 241-245). Written discussions had been prepared by H. B. Nottage, Encino, Calif.; E. F. Snyder, Jr., Minneapolis, Minn.; J. R. Carroll, Urbana, Ill.; C. S. Leopold, Philadelphia, Pa.; A. J. Hess, Los Angeles, Calif. Following the presentation of these written discussions, Chairman Dill asked for any discussions or comments from the floor and the following members responded: P. B. Gordon, New York, N. Y.; A. T. Jorn, Grayslake, Ill.; P. R. Achenbach, Washington, D. C.; Lester T. Avery, Cleveland, Ohio.

Mr. Schutrum closed the discussion by commenting on many of the points raised during the discussion, especially pointing out that the work done so far on the panel cooling project has not included the effect of sun heat or the use of luminaires.

At this point, Chairman Dill invited announcements by Vice President Haines, who at this time also received from W. C. Reamy the Report of Inspectors of Election with the following results:

Report of Inspectors of Election

BALLOT FOR OFFICERS:	TOTAL
President	
John E. Haines, Minneapolis, Minn.	2142
First Vice President	
John W. James, Chicago, Ill.	2148
Second Vice President	
P. B. Gordon, New York, N. Y.	2144
Treasurer	
E. R. Queer, State College, Pa.	2147
MEMBERS OF COUNCIL *(three-year term)*	
B. W. Farnes, Portland, Ore.	2145
C. B. Gamble, New Orleans, La.	2144
W. A. Grant, Syracuse, N. Y.	2144
D. M. Mills, Houston, Tex.	2145
MEMBER OF COUNCIL *(one-year term)*	
R. T. Kern, Leominster, Mass.	2147
COMMITTEE ON RESEARCH *(three-year term)*	
R. C. Chewning, Portland, Ore.	2146
W. S. Harris, Urbana, Ill.	2146
N. B. Hutcheon, Ottawa, Canada	2146
B. H. Jennings, Evanston, Ill.	2146
R. A. Miller, Pittsburgh, Pa.	2148
TOTAL BALLOTS RECEIVED	2175
TOTAL LEGAL BALLOTS	2148
INVALID BALLOTS	27

Scattering votes: President 6; 2nd Vice President 4; Treasurer 1; Members of Council 10; and Committee on Research 5.

Respectfully submitted,
W. C. Reamy, Jr., Chairman,
Washington, D. C.
H. H. Erickson,
Philadelphia, Pa.
C. H. Smith, Linden, N. J.

The second technical paper was presented by G. V. Parmelee, Cleveland, Ohio, following his introduction by Chairman Dill, on Measurement of Angular Emissivity, by Aydin Umur, G. V. Parmelee and L. F. Schutrum, (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning*, November 1954, pp. 135-140). P. H. Weitzel, Harrisburg, Pa., asked questions from the floor and a written discussion on this paper was then presented by H. C. Brown, Jr., Lancaster, Pa.

Chairman Dill announced that Mr. Parmelee would also present the third paper on the program. This paper was Circuit Analysis Applied to Load Estimating, Part II — Influence of Transmitted Solar Radiation, by H. B. Nottage and G. V. Parmelee, (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, February 1955, pp. 123-131).

No written discussions on this paper had been prepared, but S. F. Gilman, Syracuse, N. Y., discussed it from the floor. Mr. Parmelee then closed the discussion.

After Chairman Dill had turned the meeting over to Vice President Haines, he thereupon adjourned the Session at 12:00 noon.

Third Technical Session, Wednesday, Jan. 26, 9:30 a.m.

Second Vice Pres. John W. James, Chicago, Ill., opened the third technical session in the Ballroom of the Bellevue-Stratford Hotel, and he immediately introduced Treas. E. R. Queer, State College, Pa., to preside as chairman of the session. Chairman Queer read the rules for professional sessions and introduced R. C. Jordan, Minneapolis, Minn., to present the paper, Gas Is An Important Factor in the Thermal Conductivity of Most Insulating Materials, Part II, by R. M. Lander, Minneapolis, Minn., (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning*, December 1954, pp. 121-126).

Written discussions had been prepared by R. S. Dill, Washington, D. C.; Carl F. Kayan, New York, N. Y.; W. A. Danielson, Raleigh, Tenn. Following their presentation, Chairman Queer recognized B. M. Palmer, Newark, Ohio, who discussed the paper from the floor. Dr. Jordan closed the discussion by indicating that he would refer to Mr. Lander the various points which had been raised.

Chairman Queer next introduced M. L. Ghai, Hartford, Conn., who presented the paper, Selection of Outside Design Temperature for Heat Load Estimation, by M. L. Ghai and R. Sundaram, Hartford, Conn., (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning*, October 1954, pp. 137-143).

Written discussions from the following people were then presented: C. W. Signor, Detroit, Mich.; A. I. Brown, Columbus, Ohio; F. W. McGhan, Washington, D. C.; John Everetts, Jr., Philadelphia, Pa.; S. A. Heider, Washington, D. C.; H. T. Gilkey, Urbana, Ill. In addition, E. P. Palmatier, Syracuse, N. Y., and P. R. Achenbach, Washington, D. C., discussed the paper from the floor. Dr. Ghai then closed the discussion.

Chairman Queer introduced F. W. Hutchinson, Berkeley, Calif., to present the next paper, A Theoretical and Experimental Study of Liquid-to-Liquid Heat Transfer in Hot Water Heaters, by F. W. Hutchinson, L. J. LaTart and N. W. Smith, Rome, N. Y. (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, February 1955, pp. 111-115). No written discussions had been prepared, but Mr. James, Chicago, Ill., and Dr. Ghai discussed it from the floor, and Professor Hutchinson closed the discussion following the completion of their remarks.

Chairman Queer introduced J. L. Threlkeld, Minneapolis, Minn., who presented the paper Solar Radiation During Cloudless Days, by J. L. Threlkeld and R. C. Jordan (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, February 1955, pp. 116-122). On this paper also, no written discussions had been prepared, but it was discussed from the floor by Professor Kayan; Roger Haines, Albuquerque, N. M.; and Dr. Ghai. Both Dr. Threlkeld and Dr. Jordan commented in closing the discussion.

Following the completion of discussion, Chairman Queer turned the meeting back over to Vice President James, who thereupon adjourned the session at 12:00 noon.

Fourth Technical Session, Thursday, January 27, 9:30 a.m.

The fourth technical session, also held in the Ballroom of the Bellevue-Stratford Hotel, was opened by Pres. L. N. Hunter, Johnstown, Pa., who introduced Linn Helander, Manhattan, Kans., to act as chairman for presentation of the technical papers.

The first paper, Paths of Horizontally Projected Heated and Chilled Air Jets, by Alfred Koestel, Cleveland, Ohio (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, January 1955, pp. 221-226) was presented by Professor Koestel, following his introduction by Chairman Helander.

Written discussions had been prepared by H. B. Nottage, Encino, Calif., and S. F. Gilman, Syracuse, N. Y. Following their presentation, W. O. Huebner, New York, N. Y., discussed the paper from the floor. Professor Koestel then closed the discussion.

R. W. Waterfill, New York, N. Y., was present in person to present his paper and was introduced for this purpose by Chairman Helander. The paper is entitled Air Conditioning of Multi-Room Buildings, by R. W. Waterfill, New York, N. Y., (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning*, November 1954, pp. 141-147).

Written discussions had been prepared by J. S. King, Fairfax, Va.; Albert Giannini, New York, N. Y.; M. G. Kershaw, Philadelphia, Pa.; S. R. Lewis, Chicago, Ill.; F. W. Chambers, Toronto, Ont.; R. P. Cook, Rochester, N. Y. Following their presentation, Mr. Waterfill closed the discussion as there were no discussions from the floor.

Chairman Helander introduced H. T. Gilkey, Urbana, Ill., to present the closing paper which was, Effects of Weather Conditions on Cooling Unit Operation in a Residence, by H. T. Gilkey, W. S. Stoecker, and S. Konzo, Urbana, Ill., (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning*, December 1954, pp. 113-120).

Written discussions prepared by C. H. Neiman, Jr., York, Pa.; S. A. Heider, Washington, D. C.; K. T. Davis, Cleveland, Ohio, were presented, and following these, the discussion period was closed by Mr. Gilkey.

Following the completion of the presentation of the technical papers, Chairman Helander turned the session back over to President Hunter who called on Past Pres. Reg. F. Taylor, Houston, Tex., Chairman of the Committee on Resolutions, who presented the report of his committee.

Resolutions

WHEREAS, the first Annual Meeting of the Society under its new name, the American Society of Heating and Air-Conditioning Engineers, Inc., and the 61st Annual Meeting since its inception is now about to end, and

WHEREAS, the meeting was held in Philadelphia, a City famed for its Brotherly Love, Pigeons and a history reaching back to the time of our forefathers; a City which was the home of our Patron Saint Benjamin Franklin, and

WHEREAS, under the excellent direction of our Officers and Staff, the aims of the Society have been much advanced through the presentation of technical papers at the Technical Sessions, of value not only to the profession but also to the general public, and

WHEREAS, the Philadelphia Chapter, through its Committee on Arrangements, of which M. F. Blankin is honorary chairman, John McElgin, general chairman, and John Everetts, Jr., vice chairman, has ably provided an entertaining program and has been solicitous of the welfare and comfort of its guests, and

WHEREAS, the 12th International Heating and Air-Conditioning Exposition continues its excellent record of size and quality, with each succeeding Exposition outdoing the previous one; therefore

BE IT RESOLVED that we express our sincere gratitude and thanks:

TO the Philadelphia Chapter, its officers and committees who have made this an outstanding meeting,

TO John McElgin, general chairman, and John Everetts, Jr., vice chairman of the Committee on Arrangements, for their successful efforts in conducting a pleasant meeting,

TO the Honorable Joseph S. Clark, Jr., Mayor of Philadelphia and the City of Philadelphia for their kindly welcome and hospitality,

TO the hotel managements who have been thoughtful of our needs and comfort,

TO the authors of the technical papers and those who participated in the discussions,

TO the Philadelphia Chamber of Commerce and Convention Bureau for their assistance and efforts toward making this a successful meeting,

TO the daily and technical press, radio and television for the publicity given our activities, thereby informing the public of the Society's aim to improve the health and comfort of mankind,

TO the ladies of the Philadelphia Chapter for their untiring efforts in extending hospitality to the visiting ladies,

TO A. J. Nesbitt for his excellent presentation of our guests and speakers at the Wednesday night banquet and to Rev. Lewis A. Briner for his invocation,

TO Dr. Milton S. Eisenhower for his enlightening address on the United States and Latin America,

TO C. S. Leopold, for his contributions to engineering and the general health and comfort of mankind, thus furthering the aims of the Society; his accomplishments having been recognized by the award of the F. Paul Anderson Medal, and

TO Pres. L. N. Hunter, the officers and committees, and to all others who have contributed their time and efforts to insure a successful meeting.

Respectfully submitted,

The Resolutions Committee

Reg. F. Taylor, *Chairman*, Houston, Tex.
R. S. Dill, Washington, D. C.
S. C. Gale, Vancouver, B. C.

When President Hunter called for a motion, the Report of the Committee on Resolutions was approved. As it developed that there was no old business or any new business to come before the meeting, President Hunter then declared the 61st Annual Meeting of the American Society of Heating and Air-Conditioning Engineers adjourned at 12:00 noon.

Council and Committee Meetings

Important work was accomplished by committees which, as usual, were in session practically continuously.

Committees of the Council began meeting as early as Friday when both the Executive and Finance Committees held sessions. This was followed by a meeting of the whole Council on Saturday and on Thursday the newly elected Council held its organization meeting.

The Committee on Research began with a meeting of its Executive Committee on Saturday and this was followed by additional meetings on Sunday and Tuesday.

On Sunday, January 23, various groups from the Technical Advisory Committees concerned with environment and comfort met. On Monday there were meetings of the TAC's on Air Cleaning, Air Distribution, Odors, Sorption, and on Testing and Rating Low Vacuum Heating Pumps.

The Chapters Conference Committee held sessions on Sunday, Monday and Tuesday. On Tuesday also, the Committee on Codes and Standards met as did the Joint ASHAE-*IES* Committee. On Monday there was a meeting of the Guide Committee. Meetings were also held by the TAC's on Industrial Environment, Evaporative Cooling (subcommittee C), Cooling Load, Insulation, and on Sound and Vibration Control. On Wednesday the Publication Committee Meeting was held as well as the TAC's on Heat Flow Through Glass, the Heat Pump, and on Weather Data.

Additionally, informal unscheduled meetings between committee members and various groups and members took place throughout the whole week.

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Entertainment Highlights

As a prelude to a week of pleasant social activities for the lighter moments between technical sessions and committee meetings, many members and their wives met in the Clover Room on Sunday afternoon for a Welcome Tea and an opportunity to see old friends and get acquainted with new ones.

Monday afternoon, following the Welcome Luncheon at which time 488 members and guests heard an interesting welcoming address by Hon. Joseph S. Clark, Jr., mayor of Philadelphia, the ladies stepped aboard special buses for either a tour of Philadelphia historic places or a visit to the Art Museum.

Hon. Joseph S. Clark, Jr., mayor of Philadelphia, welcoming ASHAE members and guests to Philadelphia

That evening just about everybody attending the 61st Annual Meeting headed for the Benjamin Franklin to participate in the Delaware Valley, U. S. A. Frolic which featured a buffet supper and a three-act play, as well as dancing. *The Man That Corrupted Hadleyburg* was an amusing comedy aptly portrayed by the Pallette Players of the Cheltenham Art Center. Deviating from the normal stage presentation of a play, these spirited players made the entire audience a stage, seating themselves among the spectators and storming down the aisles at unexpected moments. The play was followed by dancing with many still on hand to participate in the last dance at one o'clock.

Tuesday morning 230 ladies were taken for a tour of the famous and beautiful Longwood Gardens just outside of Wilmington, Del. The trip to this veritable paradise was interrupted so that the ladies could enjoy a relaxing and pleasant luncheon at the fashionable Drexelbrook Inn.

Past Presidents' Dinner

In the evening the Past Presidents' Dinner held in the Union League of Philadelphia was attended by Lester T. Avery, Cleveland, Ohio, M. F. Blankin, Philadelphia, Pa., S. H. Downs, Kalamazoo, Mich., W. L. Fleisher and Alfred J Offner, New York, N.Y., L. E. Seeley, Durham, N.H., A. E. Stacey, Jr., Syracuse, N.Y., Ernest Szekely, Milwaukee, Wis., Reg. F. Taylor, Houston, Tex., and G. L. Tuve, Cleveland, Ohio. Also in attendance were President Hunter and A. V. Hutchinson.

A luncheon and fashion show in the ballroom of the Warwick Hotel on Wednesday was another delightful diversion for the ladies.

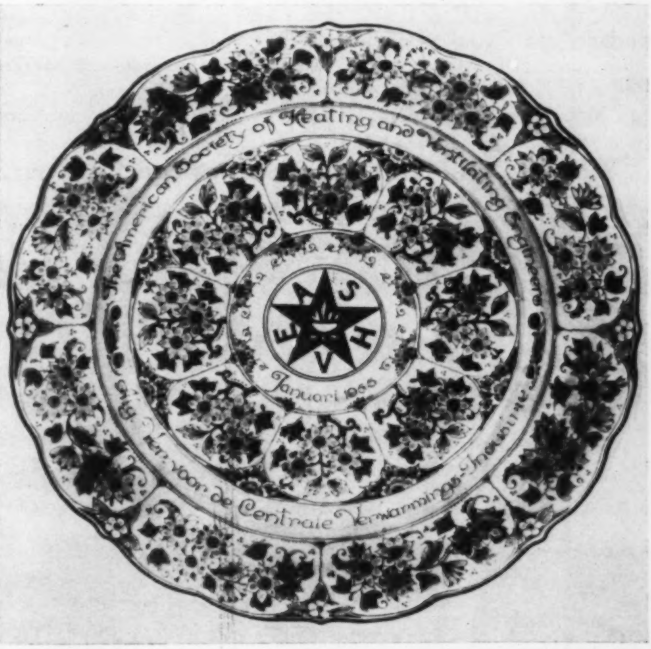
Banquet

The climax, as always, of every Annual Meeting was the banquet and the festive atmosphere created by the ladies in their evening gowns and the many men in formal attire. Over

Picture Captions

☛

(l. to r.) 1. Pres. L. N. Hunter, Mrs. John E. Haines, Past Pres. M. F. Blankin, Mrs. Alfred J. Nesbitt, C. S. Leopold, Mrs. E. R. Queer, Rev. Lewis A. Briner. 2. President Hunter receiving past president's medal from M. F. Blankin, with Toastmaster A. J. Nesbitt at left. 3. W. R. Stockwell receiving 50-year scroll from President Hunter. 4. Henry Meijer extends greetings from the Netherlands delegation before presenting the inscribed delft plate to the Society. President Hunter at right. 5. C. S. Leopold receives the F. Paul Anderson Medal from Pres. Hunter. 6. New Council: R. T. Kern, B. W. Farnes, C. B. Gamble, W. A. Grant, D. M. Mills. 7. President Hunter presents gavel to President-Elect John E. Haines with Vice Presidents John W. James and P. B. Gordon. 8. Treas. E. R. Queer, Mrs. Blankin, Vice President James, Mrs. Leopold, President-Elect Haines, Mrs. Hunter, Dr. Milton S. Eisenhower, Toastmaster Nesbitt *(standing)*. 9. John Everetts, Jr., Mrs. Gordon, J. W. McElgin, Vice President Gordon, Mrs. Everetts, Mrs. E. K. Stevens


The American Society of Heating and Ventilating Engineers
Januari 1955
voor de Centrale Verwarmings-Industrie
ASHVE

Decorative Delft plate presented to the Society at the 61st Annual Banquet by the *General Society for Central Heating in Industry,* a Netherlands organization of engineers. Henri Meijer, managing director of Wolter & Dros N. V., Amersfoort and teamleader of a group of Netherlands heating and air-conditioning engineers traveling in this country, made the presentation to President Hunter.

1100 were present to enjoy the delicious dinner, and to hear Dr. Milton S. Eisenhower deliver a splendid talk on the Latin Americas.

One of the highlights of the banquet was the presentation of the F. Paul Anderson Medal to C. S. Leopold of Philadelphia by President Hunter. Of equal importance and interest was the awarding of 50-Year Scrolls to S. R. Lewis, Chicago; H. C. Meyer, Jr., New York, N. Y. and W. R. Stockwell, Michigan City, Ind.

The installation of the new officers and the presentation of the Past President's Emblem to Mr. Hunter by M. F. Blankin, honorary chairman of the Committee on Arrangements, concluded the activities at the head table which were successfully guided by toastmaster A. J. Nesbitt.

On Thursday, terminating the week's social activities, 60 ladies traveled by bus to Atlantic City. Here they had an opportunity to either walk or ride along the world's most famous boardwalk and enjoy a luncheon in the famous Wedgewood Room of Haddon Hall Hotel. This concluded the special events for the ladies arranged by a committee headed by E. H. Dafter and co-chairman Mrs. Merrill F. Blankin.

M. W. Keyes (*standing third from left*) chairman, TAC on Insulation meets with his committee during 61st Annual Meeting

B. H. Jennings (*center*) chairman of Committee on Research, in session during recent Annual Meeting

We are indebted to W. M. Wallace, II, Durham, N. C., who made available the photographs reproduced throughout the Proceedings of the 61st Annual Meeting, including the committee picture on this page.

Successful 12th Exposition Seen by Over 30,000 Engineers, Contractors

Ribbon cutting ceremony opening the 12th International Heating and Ventilating and Air Conditioning Exposition. (*l. to r.*) ASHAE Vice Pres. John W. James, Pres. L. N. Hunter, E. K. Stevens, exposition manager, and W. M. Phillips, Philadelphia director of commerce. (*rear*) 1st Vice Pres. John E. Haines and Treas. E. R. Queer

Manufacturers of heating, ventilating and air-conditioning equipment presented larger and more spectacular displays at the 12th International Heating, Ventilating and Air-Conditioning Exposition than ever before.

A record 470 exhibits was indicative of the industry's expanding outlook. The increased number of exhibitors and the use of larger exhibiting space also made it apparent that the manufacturers are looking forward to even greater expansion in the industry. Although basically a display of heating and ventilating equipment, the Exposition covered all the recognized systems in use including steam and vacuum-vapor heating, hot water and air, and several variations in the method of circulating water and air. This greatest Exposition marked the 25th year since the first was held in 1930.

1954 ANNUAL REPORT COMMITTEE ON RESEARCH

R. S. Dill, Chairman

R. S. Dill, Chairman
Committee on
Research

B. H. Jennings, Vice
Chairman Committee
on Research

As SET forth in my report of a year ago, the research program in early 1954 was handicapped by certain problems. In particular, the Laboratory Staff had been depleted by resignations and lack of suitable replacements, and no Director of Research had been appointed since the passing of Cyril Tasker the preceding May. Danger, therefore, existed that the work might be seriously impeded. Under these circumstances the Committee on Research was glad to have the advice and assistance of Council and other Society members. In particular we had the advantage of a president with an interest and much past experience in research. Pres. L. N. Hunter was a very active participant in our search for a man with the essential experience and other qualifications to conduct a broad-scale research program and, chiefly as a result of his efforts, Elmer R. Kaiser was appointed and accepted the post of director of research. As a result of all this, I can now report that several personnel vacancies have been filled, new projects have been activated, old projects were completed with important results and the budget was increased for the current year. In general it appears that now the Research Program is being and will continue to be vigorously pushed.

On August 15, Mr. Kaiser assumed his duties as director of research for the Society, with headquarters at the Research Laboratory. Mr. Kaiser brings to ASHAE over 20 years' experience on research in fuels and heat power, as well as in the administration of research programs for associations. He is responsible for the programs at the Laboratory and the cooperating institutions, and for the research fund raising, the latter under the guidance of the Finance Committee.

C. M. Humphreys served very efficiently as acting director of research after the demise of Mr. Tasker in May 1953 and won the admiration of his numerous friends on the Committee and in the Society generally while carrying a double load.

Budget and Finances

The research budget for the fiscal year ending October 31, 1954, was $177,450. The actual expenditures and sources of funds are shown by Fig. 1 and the relation between expenditures during this and previous years is shown by Figs. 2 and 3. The budget was maintained at essentially the same level as during the previous year, and receipts equalled the budget. The expenditures were slightly under the budget because personnel was not available to undertake some of the work planned.

The budget does not directly indicate the actual magnitude of the research effort. Recognition is gladly given for the additional funds and unpaid time spent by the cooperating institutions in furtherance of Society-sponsored projects. In some cases the Society contributes only one-fifth of the total expenditure for the results reported in its research papers.

A new budget for 1955 was approved at $245,875, an increase of 40 percent over that for 1954. The increase is warranted by the demand for additional programs, as well as by the prospects for increased funds from the larger Society membership. Nevertheless, to meet this budget, the contributions from industry must be doubled. Some of the new projects will not be undertaken until the funds are in sight.

Plans for an expanded fund-raising campaign under Mr. Kaiser's direction are being formulated with the Finance Committee of the Society and with the advice of the Ways and Means Committee and the executive secretary. More publicity is also in prospect for the research through the combined activities of a new public relations director at the Society headquarters and the director of research.

It is hoped that the new research director can lead the Society research to continued growth by accomplishment and by the organization of cooperation and financial support.

Laboratory Staff

The Laboratory gained several new staff members in replacement of normal turnover and as additions to help activate projects. Four members of the key technical staff have been at the Laboratory for 10 years. Promotions in responsibility and title have been given to several engineers. Before the year's end a new staff organization chart was approved.

Committee on Research

R. S. Dill, *Chairman;* B. H. Jennings, *Vice Chairman.*

Three Years: John Everetts, Jr., W. F. Friend, Carl F. Kayan, H. R. Limbacher, E. F. Snyder, Jr.

Two Years: R. S. Dill, F. H. Faust, F. K. Hick, M.D., H. A. Lockhart, J. W. McElgin.

One Year: I. W. Cotton, W. A. Grant, N. B. Hutcheon, B. H. Jennings, C. O. Mackey.

Executive Committee: R. S. Dill, *Chairman;* B. H. Jennings, *Vice Chairman;* John Everetts, Jr., F. H. Faust, C. O. Mackey.

Long-Range Research Program: B. H. Jennings, *Chairman;* John Everetts, Jr., F. H. Faust, John W. James, C. O. Mackey, R. S. Dill, Ex Officio.

The present full-time staff of 19 consists of the following members:

E. R. Kaiser, director of research; C. M. Humphreys, assistant director of research; G. V. Parmelee, senior research supervisor; L. F. Schutrum, research supervisor; R. G. Huebscher, research supervisor (on year's leave to Naval Medical Research); W. F. Kerka, research engineer; T. C. Min, research engineer; D. J. Vild, research engineer; A. N. Cerny, mathematician; T. B. Fenzel, industrial liaison; H. H. Huebscher, mechanic; Ilse M. Jahn, secretary and administrative assistant to the director; Vera Durana, librarian; Rosemary Green, bookkeeper; Norma Pont, Theodora Kucha, Gertrude Schultz, and Karen Thomas, stenographers; W. F. Trapp, janitor.

In addition, temporary laboratory assistance was provided by up to three engineering cooperative students at a time from Fenn College, who gained industrial experience as part of their college education.

The staff will be augmented as the program grows but was balanced before the end of the year to conduct the work outlined within the funds available.

Ultimately it is hoped that more young engineers may receive post-graduate training in research at the Laboratory before becoming available to industry.

The staff has cooperated fully with the Committee on Research and their efforts and accomplishment deserve high praise.

Much of the information developed has been or will shortly be published in the JOURNAL and be incorporated into THE GUIDE.

Committee Activities

The Committee on Research held four meetings during the year, two at the Annual Meeting in Houston, one at the Semi-Annual Meeting in Swampscott, and one at the Laboratory. In addition, the Research Executive Committee met six times. The members of the committee have also been commendably diligent in attending 31 meetings of the Technical Advisory Committees on which they also serve, and in correspondence and liaison activities with other organizations.

Journal Section

Twenty Technical Advisory Committees, three coordinating committees, and 14 subcommittees, organized by specific fields of activity, were manned during the year by 259 experts from industry, universities, scientific laboratories, and consulting practice. Some members served on more than one committee. A total attendance of 271 committee members and 145 visitors was recorded at the committee meetings.

The Technical Advisory Committees considered progress reports, reviewed the technical papers, and recommended projects for inclusion in the budget. The practical touch and professional contacts throughout the industry were of invaluable assistance to the researchers. The exchange of viewpoints and experience among the members at the meetings was an additional incentive to attendance.

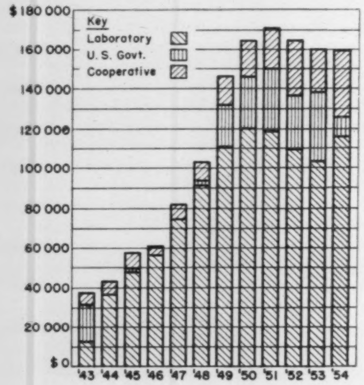


Fig. 1—Research expenditures 1943-1954

The Chairman wishes to express his appreciation to all those who gave so liberally of their experience and time to the committee work during the two years of his tenure as chairman.

In behalf of the Committee and the Technical Advisory Committees special thanks are given to Miss Ilse M. Jahn, secretary to the Committee, under whose able direction the minutes of the many meetings were excellently taken, transcribed, edited, and distributed.

Research Policy and Planning

The policies and procedures with respect to the functions and responsibilities of the Committee on Research, the director of research, and the Technical Advisory Committees are outlined in an Operational Guide, which has been approved by Council. The director is responsible to the Council and Society through the Committee on Research.

We are glad to report that the new director is reviewing the research papers editorially with a view to improving their understandability and value to the general membership. Authors, particularly mathematicians, often employ terms peculiar to their own fields so that many readers find it difficult if not impossible to follow their argument or even understand their conclusions.

A Long-Range Research Program has been functioning for more than a year under the chairmanship of Prof. B. H. Jennings. The research program is constantly under scrutiny and review.

Research Projects

One is impressed by the broad scope of the program, and the extent of the accomplishment when preparing a report of this kind.

During the fiscal year ending October 31, 1954, there were nine active projects at the Research Laboratory in Cleveland and 14 cooperative research projects at 11 institutions over the country. The report of the director of research provides an extended review of these projects and the accomplishments but the highlights are briefly stated here in the following paragraphs:

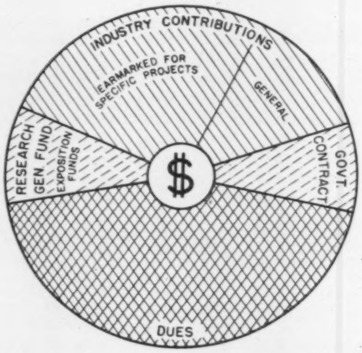


Fig. 2—Sources of funds expended on Society research in 1954

Dues	$ 69,784
Contributions	
Earmarked	41,090
General	19,393
Government contract	13,341
Research gen'l funds	15,498
	$159,106

The project on physics of sorption (dehumidification) was highly productive of the results sought for solid sorbents. For the first time we now know the quantitative relationships between the physical factors and the adsorption efficiency, breakpoint, breakpoint time and completion time. The manufacturers of dehumidifiers helped to underwrite the project.

Cooling effect of ceiling panels was measured in the Environment Laboratory in Cleveland, resulting in design data of practical usefulness. The temperature gradients from floor to near the ceiling were small, a condition conducive to comfort. Design data for panel heating are being prepared. Design data for panel cooling will follow.

Careful measurements on normal and abnormal human subjects by the University of Illinois, College of Medicine, indicated the adaptability without shock of people subjected to sudden changes in environmental conditions.

Quantitative results were reported on air temperatures and velocities in rooms supplied with downward jets of hot and cold air from unit heaters and horizontal jets from wall outlets.

Performance of some room air-distribution systems were evaluated.

Periodic heat flow through some specimen roof sections has been measured and will be used to check methods of calculation.

Solar radiation and its effect on structures is now more fully understood as the result of the work at the Laboratory and at the University of Minnesota. Direct solar radiation and diffuse radiation from the sky generally to vertical and horizontal surfaces are now known with greater accuracy. The effect of angular emissivity of heat from various building surfaces was measured and found to decrease at flat angles to the surface. The glass industry is a strong supporter of the radiation work.

Air contaminants will be measured more rapidly and accurately as a result of the development by the University of Minnesota of a new centrifugal sedimentation apparatus.

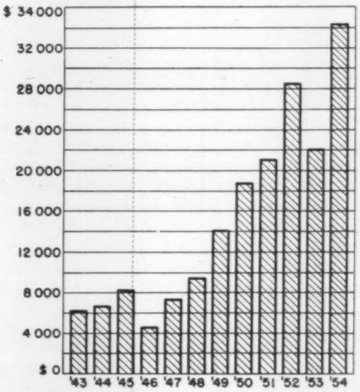


Fig. 3—ASHAE direct grants to cooperating colleges and universities 1943-1954

Techniques were developed at Northwestern University for measuring frequencies and sound levels produced by the flow of water through pipe and fittings. A seemingly quiet pump can produce vibrations in the water which cause audible noises in a fitting or section of pipe at a considerable distance where resonance is produced. Measurement is the first step toward noise prevention.

At Northwestern University unusual metastable effects of sudden and rapid boiling of water were demonstrated in glass and small metal vessels. Water was heated at atmospheric pressure up to 20 F above the normal boiling point and, upon being disturbed, the water flashed into steam with a vigorous expansion. The possible effect in hot-water and steam-heating systems is being investigated.

Generation of gas in hot-water heating systems and the movement of gas out of the expansion (compression) tank is now under study at the University of Illinois in a full-scale laboratory installation of a residential heating system. Air entrainment in hot-water piping is under study at the University of Florida.

Measurement of odor intensities and qualities by a trained panel is now in progress in the Laboratory. The influence of air temperature and humidity on odor perception has been measured, indicating a minor effect of temperature but a major effect of absolute humidity in suppressing the perception of odor.

Ventilation requirements for cigarette smoke were determined by tests with human subjects and reported.

A major step forward was achieved by the Laboratory and the University of California in developing further the calculation of cyclic heating and cooling loads by the thermal-circuit technique.

Revised values of heat conductivity in insulation materials were compiled and are included in THE GUIDE 1955.

A new method of analyzing summer weather data was developed to determine design weather conditions for cooling different types of buildings.

Research Papers

The Research Program of the ASHAE yielded 13 papers for presentation at meetings and for publication in the ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning.* The first six papers listed below were presented at the Swampscott Meeting of the Society in June and the last seven were made available for the Annual Meeting in Philadelphia in January 1955, as follows:

1. Computing Temperatures and Velocities in Vertical Jets of Hot or Cold Air, by Alfred Koestel (Cleveland, Ohio) (June 1954 JOURNAL SECTION).

2. Physiological Response to Sudden Changes in Atmospheric Environment: Studies of Normal Subjects, Obese, Hyperthyroid and Hypothyroid Patients, by Tohru Inouye, F. K. Hick, M.D., R. W. Keeton, M.D., and Lionel Bernstein, M.D. (Chicago, Ill.) (July 1954 JOURNAL SECTION).

3. Sound-Pressure Levels and Frequencies Produced by Flow of Water Through Pipe and Fittings, by W. L. Rogers (Evanston, Ill.) (July 1954 JOURNAL SECTION).

4. Irradiation of Vertical and Horizontal Surfaces by Diffuse Solar Radiation from Cloudless Skies, by G. V. Parmelee (Cleveland, Ohio) (August 1954) JOURNAL SECTION.)

5. Characteristics of Downward Jets of Heated Air from a Vertical Discharge Unit Heater, by Linn Helander, S. M. Yen and L. B. Knee (Manhattan, Kans.) (September 1954 JOURNAL SECTION).

6. Effects of Room Size and Non-Uniformity of Panel Temperature on Panel Performance, by L. F. Schutrum and J. D. Vouris (Cleveland, Ohio) (September 1954 JOURNAL SECTION).

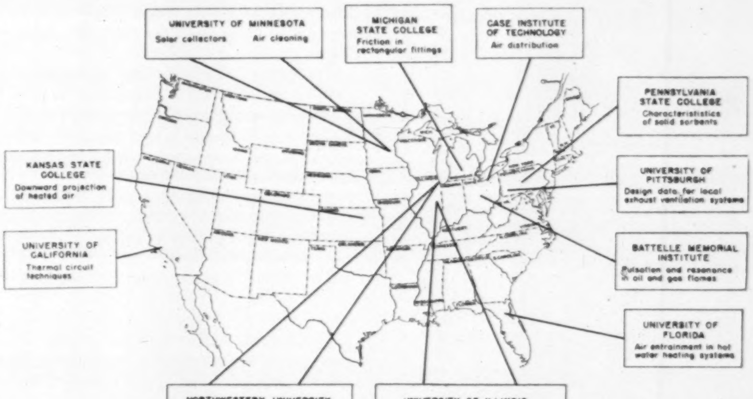

UNIVERSITY OF MINNESOTA
Solar collectors
Air cleaning
MICHIGAN STATE COLLEGE
Friction in rectangular fittings
CASE INSTITUTE OF TECHNOLOGY
Air distribution
PENNSYLVANIA STATE COLLEGE
Characteristics of solid sorbents
KANSAS STATE COLLEGE
Downward projection of heated air
UNIVERSITY OF PITTSBURGH
Design data for local exhaust ventilation systems
UNIVERSITY OF CALIFORNIA
Thermal circuit techniques
BATTELLE MEMORIAL INSTITUTE
Pulsation and resonance in oil and gas flames
UNIVERSITY OF FLORIDA
Air entrainment in hot water heating systems
NORTHWESTERN UNIVERSITY
Noise in piping systems
Metastable state in heating boilers
UNIVERSITY OF ILLINOIS
Infiltration studies
Venting hot water heating systems

Fig. 4—ASHAE Cooperative Research 1954

7. Preliminary Studies of Heat Removal by a Cooled Ceiling Panel, by L. F. Schutrum, John Vouris, and T. C. Min (Cleveland, Ohio) (January 1955 JOURNAL SECTION).

8. Circuit Analysis Applied to Load Estimating, Phase II, by H. B. Nottage and G. V. Parmelee (Cleveland, Ohio) (February 1955 JOURNAL SECTION).

9. Paths of Horizontally Projected Heated and Chilled Air Jets, by Alfred Koestel (Cleveland, Ohio) (January 1955 JOURNAL SECTION).

10. Solar Radiation during Cloudless Days, by J. L. Threlkeld and R. C. Jordan (Minneapolis Minn.) (February 1955 JOURNAL SECTION).

11. A Rapid General Purpose Centrifuge Sedimentation Method for Measurement of Size Distribution of Small Particles, Part — Apparatus and Method, by K. T. Whitby (Minneapolis, Minn.) (January 1955 JOURNAL SECTION).

12. Ventilation Requirements for Cigarette Smoke, by C. P. Yaglou (Boston, Mass.) (January 1955 JOURNAL SECTION).

13. Measurement of Angular Emissivity, by Aydin Umur, G. V. Parmelee, and L. F. Schutrum (Cleveland, Ohio) (November 1954 JOURNAL SECTION).

One research paper is scheduled for presentation at the April 1955 Regional Meeting in Oklahoma City under the following title:

A New Method of Analyzing Weather Data Needed in the Design of Cooling Systems: Illustrated by Data for New Orleans, by G. V. Parmelee, G. E. Sullivan and A. N. Cerny.

Among the papers for future meetings either completed or in preparation, are the following:

1. An Analysis Method for Predicting Characteristics of Solid Adsorbents in Solid Sorption Dehumidifiers, by W. L. Ross and E. R. McLaughlin.

2. Air Velocity in Two Parallel Ventilating Jets, by Alfred Koestel and J. B. Austin, Jr.

3. A paper from Michigan State College on Friction Losses in Rectangular Take-Off Fittings.

4. Atmospheric Air Pollution and Its Analysis, by K. T. Whitby, R. C. Jordan, and A. B. Algren.

5. Design Procedures for Panel Heating, by L. F. Schutrum.

6. Analysis of a Thermal Circuit by Electronic Differential Analyzer, by G. V. Parmelee.

7. Electric Analogue Prediction of the Thermal Behavior of an Inhabitable Enclosure, by Harry Buchberg.

ASHAE RESEARCH IN COOPERATING INSTITUTIONS

Battelle Memorial Institute, Columbus, Ohio: Pulsation and Resonance in Domestic Oil and Gas Burners.

University of California, Los Angeles, California: Thermal Circuit Techniques Applied to Heating and Cooling Problems.

Case Institute of Technology, Cleveland, Ohio: (Research Fellowship) Air Flow from Annular Slots, Ceiling Plaques and Circular Diffusers.

University of Florida, Gainesville, Florida: Air Entrainment in Hot-Water Heating Systems.

University of Illinois, Urbana, Illinois: (*a*) Study of Infiltration in a Residence Using the Tracer-Gas Technique. (*b*) Gas Formation in and Entrainment of Gas in Venting of Hot-Water Heating Systems.

Kansas State College, Manhattan, Kansas: The Downward Projection of Heated Air Streams.

Michigan State College, East Lansing, Michigan: Friction in Rectangular Branch Take-Off Fittings.

University of Minnesota, Minneapolis, Minnesota: (*a*) Air Filtration Research Program. (*b*) Solar-Energy Absorber Studies.

Northwestern University, Evanston, Illinois: (*a*) Noise in Piping Systems. (*b*) Metastable State of Water in Heating Boilers.

The Pennsylvania State University, State College, Pennsylvania: (Research Fellowship) Physics of Sorption.

University of Pittsburgh, Pittsburgh, Pennsylvania: (Research Fellowship) Design Requirements of Local Exhaust Ventilation for Removal of Atmospheric Contaminants Released by Hot Industrial Processes.

1954 Report of Director of Research

By E. R. Kaiser and C. M. Humphreys

E. R. Kaiser

The objective of the research program is the discovery of basic scientific facts and the development of useful data and relationships in heating, cooling, ventilating and air conditioning. All of the factors ranging from weather and physical environments to human response and sensations are of interest. New trends in mechanical equipment and building construction are included.

Although accuracy in calculating heating and cooling loads and in selecting design conditions has improved over the years, experience indicates the need for more facts to reduce the magnitude and frequency of error and thus to increase satisfaction.

Beyond the purely scientific and applied research, better presentation of results, and greater educational and public relations efforts are part of the responsibility of the research team.

The work of the Society's Research Laboratory in Cleveland is supplemented by projects under contract with cooperating institutions. Not only have valuable publications resulted from these sponsorships, but engineering and scientific personnel have been trained in air conditioning. The research at the cooperating institutions has usually been financed only in part by the Society.

Guidance by the Committee on Research and the Technical Advisory Committees has been invaluable to technical progress and to maintaining high morale and enthusiasm among the researchers.

Staff

During 1954 the Research Laboratory obtained additional trained staff members to undertake new projects and to complete others in progress. Several experienced members of the staff were promoted for clearer definition of responsibility and authority.

C. M. Humphreys, formerly senior engineer, was named assistant director of research with responsibility on cooperative projects and committee activities, as well as numerous other activities.

G. V. Parmelee was made senior research supervisor in the field of heat transfer. He has achieved an international reputation in solar radiation through glass and in allied fields.

L. F. Schutrum, research supervisor, is in charge of work being done in the Environment Laboratory.

R. G. Huebscher, a ten-year man now on leave, was promoted to research supervisor.

Alex Cerny joined the staff as mathematician in April after a career as lecturer in mathematics at Charles University, Prague, and research scientist at the University of Florence, Italy. He is assisting Mr. Parmelee on the development of equations for the thermal circuit analyses.

T. C. Min came to the Laboratory in July from the Tennessee Valley Authority and University of Tennessee. He is a research engineer in the tests of panel heating and cooling.

W. F. Kerka is a new research engineer who joined the staff in July to conduct the program on odor perception. He has a master's degree from Case Institute and taught heat power at Oregon State College.

T. B. Fenzel joined the staff in December to become industrial liaison representative of the Laboratory. He is a graduate of Baldwin-Wallace College and served three years with the Navy.

A most competent senior technical assistant, Mrs. Doris Gates, left in November after a ten-year tenure, to embark on a family career.

During four years at the Laboratory, J. G. Slaby, research engineer, completed work on the human calorimeter and on air distribution. He has taken a research position in industry.

Engineering students from Fenn College, Cleveland, from one to three at a time, assisted in the programs during the year and added to their experience in our profession.

Equipment and Facilities

The two test rooms for odor studies were completed in 1954 to provide a major basic-research facility. No other major equipment was acquired. The Laboratory is well equipped with smaller instrumentation for studies of most factors in air conditioning, but may need computing or analogue equipment for studies of periodic heat flow.

Renovation of several staff offices, repainting of the office exterior, and major roof repairs were completed to bring the building to a high level of maintenance.

Air Cleaning

Early in 1954 the TAC on Air Cleaning adopted a new scope and objective, *to study the basic character of the contaminants present in the air and the factors influencing their removal . . .* Limited to air delivered to confined spaces (such as rooms and ventilating systems) the goal is to make available information necessary for the development of standard methods for testing and rating air-cleaning devices and to aid in the selection of air cleaners.

C. M. Humphreys

Air Filtration Research Project (University of Minnesota): The cooperative project under A. B. Algren was established in August to complete the development of an improved centrifugal sedimentation apparatus for measuring particle-size distribution in samples obtained from the atmosphere, such as would enter buildings. The method was developed by K. T. Whitby and associates and found practical over the range of particle sizes from 100 to 0.05 microns. A micron is 1/25,400 in. The method requires representative dust samples of less than one gram.

An extensive search of the literature on air pollution has been made. A technical paper describing the apparatus, methods, procedure and application was completed for presentation. Other apparatus was also assembled to collect dust samples and to study the discoloration (blackening) effect caused by minute particulate matter.

Future work will be directed toward the development of suitable samplers to determine quantitatively the amount and character of particulate matter in the air at any location. By use of the new methods and data the requirements for air cleaners could be evaluated more satisfactorily than was previously possible.

A seminar on Air Cleaning is proposed, to be held at the University in March 1955.

Air Distribution

During 1954 four research projects were under way under the guidance of the TAC on Air Distribution.

Air Flow from Annular Slots, Ceiling Plaques and Circular Diffusers (Case Institute of Technology): Research resulting in two papers was completed and reported. The paths assumed by horizontally projected heated and chilled air jets under the influence of buoyant forces were explored and the formulas were developed for predicting and expressing jet patterns.

The results are important in heating and cooling with outlets located on walls. When a chilled air jet prematurely enters the occupied zone, draft may be experienced, especially if the temperature differences and velocities are still high due to insufficient mixing.

A paper on Performance and Evaluation of Room Air Distribution has been prepared for early presentation. An extensive test plant was built for the latter studies. Flow patterns were explored for several methods of air distribution when heating with low-temperature air, as from heat-pump systems.

Work on annular jets and on the intermixing of parallel air jets will continue during 1955 under the direction of Profs. G. L. Tuve and Alfred Koestel. Included will be experimental work on ceiling diffusers, exploration of jets from single-slot annular diffusers of basic design, and correlation with previous work on radial diffusers. Serious consideration is also being given to the preparation of a comprehensive report summarizing the work at Case with air-flow patterns from various outlets, perforated panels, and diffusers.

Downward Projection of Heated Air (Kansas State College): At the 1954 Semi-Annual Meeting, a paper reported on the downward projection of air from a unit heater fitted with three different types of outlets, viz.: annular, deep conical, and shallow diffuser. Data on throw were correlated with conditions at the outlet, and temperature and velocity profiles over a distance of 5 ft down from the outlet were presented. The most effective throw and air distribution from a unit heater were obtained when the fan and outlet were properly designed and properly matched to each other.

Linn Helander is planning to continue the experimental work, to report additional results on air flow beyond the outlets and to correlate the findings with those of Case Institute, particularly in regard to velocities and temperatures along the jet centerlines.

Friction in Rectangular Branch Take-Off Fittings (Michigan State College): Experimental work on this project has been completed and a paper is in preparation under the direction of C. H. Pesterfield. Analysis of the extensive test data presented a difficult problem, and a subcommittee of the TAC was appointed to assist in this phase of the work.

Pitot-Tube Studies (ASHAE Research Laboratory): A literature search was completed to determine the possibilities and accuracies of standard and smaller Pitot tubes for use in air-flow measurements in pipes under 8-in. diam. It was found that Pitot tubes down to one-half standard diameter (5/32 in.) could be used for traverses in pipes without serious error. Experimental work would be required to test smaller Pitot tubes and to determine the limiting flow rates and pipe sizes.

The study was made as a preliminary to a possible research project.

Combustion

Major research with the joint financial support of the *American Gas Association*, the *Oil Heat Institute*, and ASHAE was started in June under the guidance of the TAC on Combustion, T. H. Smoot, chairman, and a special Steering Committee, H. R. Limbacher, chairman.

Pulsations and Resonance in Domestic Oil- and Gas-Fired Heating Equipment (Battelle Memorial Institute): Pulsations and resonance in oil- and gas-fired central heating equipment have long been troublesome, unpredictable and unexplained. Burners that are quiet in one installation may be noisy in another. Corrective measures for one burner were frequently not effective with others.

The project was begun at Battelle with A. A. Putnam in charge. During the first seven months Battelle conducted a survey of eight installations and measured resonance frequencies of 11 to 76 cycles a sec, — a low hum. A study of the pulsations in laboratory installations showed that a standing pressure wave existed in the furnace and gas passes, as in an organ pipe. The amplitudes were maximum in the furnace and decreased to near zero at an open check damper or back-draft diverter in the flue pipe. The frequencies could be varied by changing the position of the barometric damper on the flue pipe. Air-fuel ratio was also a factor. Motion pictures of the flames were taken for frame-by-frame study.

As the origin of the noise is at the burner and in the flame, special test furnaces are being fabricated for more detailed study of the factors. No papers have been published.

Cooling Load

All of the work done during 1954 under the guidance of the TAC on Cooling Load, C. O. Mackey, chairman, had as its goal the development of more accurate methods of determining instantaneous loads of cooling equipment during daily cycles of heat gains to structures. Because of the cost of cooling equipment and electric power, accurate surveys of cooling loads are necessary for economical sizing of installed capacity.

Air-Conditioning Thermal Circuit (ASHAE Research Laboratory): The *thermal circuit* technique of calculating heating and cooling loads was developed at the Laboratory by H. B. Nottage several years ago. The method includes the effects of cyclic variations in daily weather data in combination with the heat capacity and thermal conductivities of the structure, windows, exposure and other factors when calculating the hour-by-hour cycle of heating or cooling load.

In this program the instantaneous equipment load for a single room was calculated by Dr. Nottage and Mr. Parmelee and was compared with results obtained by conventional methods which neglect thermal storage. As an extension of the problem, in 1955 the heat-flow equations were rewritten to include the solar radiation directly transmitted through the glass portion of an outer wall. Further work is in progress by Mr. Cerny to develop formulas on thermal resistance and capacitance.

The results show that the present method used in The Guide overestimates the instantaneous load, because it does not consider the interaction between the internal walls, floor and ceiling with those sections of the room exposed to the weather. This interaction causes cyclic variations in the surface temperatures of the inner construction, with consequent cycles of heat storage and withdrawal from these sections of part of the radiant energy which enters the room.

During the year the Laboratory staff became familiar with the application of the differential equation analyzer to the solution of the thermal-circuit problems. The analyzer was utilized to calculate instantaneous cooling loads for a room having shaded windows and cooled by a ceiling panel in combination with an air system. The results will be presented in a paper during coming months.

Thermal Circuit Techniques Applied to Heating and Cooling Problems (University of California): During the summer of 1953 the thermal performance of a one-room test house was observed under actual weather conditions for a period of several days. The house was neither heated nor cooled.

The thermal behavior of the same house, when subjected to the same diurnal cycles, was then predicted by solving the thermal circuit representing the idealized system by means of a thermal-electrical analogue. An extensive report by Harry Buchberg was received which shows that a reasonably close comparison had been obtained, and that the electrical-analogue method is promising. The report is being condensed for a technical paper.

During 1955 additional studies will be undertaken with the analogue to determine the effects of various modifying factors on the heating and cooling loads of buildings. Finally, a study will be made to devise methods of reducing the analogue results to forms useful in actual design problems.

Periodic Heat Flow Through Roof Sections (ASHAE Research Laboratory): Tests have been conducted to compare periodic rates of heat flow for multi-layer construction, computed by application of the theory developed by Mackey and Wright, with heat-flow rates measured under actual weather conditions. Two roof sections were tested, the heavier of which consisted of 3-in. concrete, 2-in. rigid insulation, and built-up roofing. This roof section was tested, first with the insulation on top, and then in the inverted position. The lighter roof section consisted of a 3-in. precast slab of calcium silicate to which built-up roofing was applied.

Analysis of the data by Mr. Cerny is almost completed, and a paper presenting the results will be prepared during 1955.

Selecting Design Conditions from Summer Weather Data (ASHAE Research Laboratory): The objective of the study was to develop a method for analyzing summer weather data for selecting design weather values of dry-bulb and wet-bulb temperatures and of solar radiation. The method was to be applicable for different types of buildings and for local weather data in different localities.

Sol-air temperature data for New Orleans were prepared previously under a cooperative agreement with Tulane University. The data were then modified to take into account the low-temperature radiant exchange with the atmosphere and the ground.

A method has been developed by Mr. Parmelee for analyzing local weather data to determine the design weather conditions for summer cooling. The conditions selected were found to be quite different when cooling residences and theaters. A paper has been prepared which will be presented in 1955.

Evaporative Cooling

The TAC on Evaporative Cooling is concerned with *the study of problems relating to the transfer of heat and mass in the evaporative cooling of fluids.* A. J. Hess is chairman.

Three subcommittees are active in studying the problems with cooling towers, evaporative condensers and evaporative air cooling.

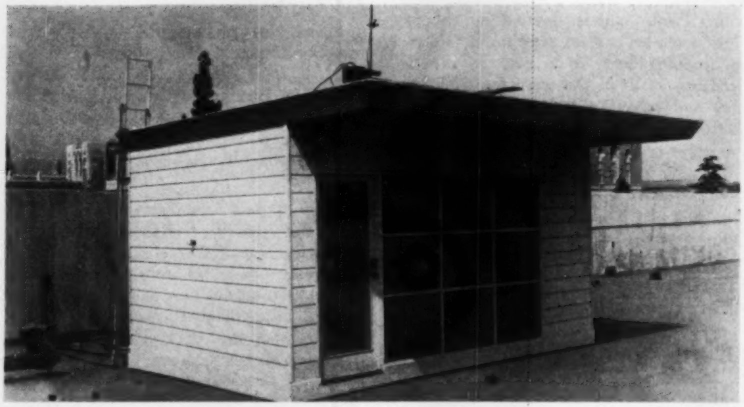
Heat Flow Through Glass

As current interest in heat transfer through glass is mainly on solar radiation, a paper on Irradiation of Vertical and Horizontal Surfaces by Diffuse Solar Radiation from Cloudless Skies was prepared by Mr. Parmelee. With the data measured in Cleveland, curves were prepared which provide a means of estimating the diffuse and direct components of solar radiation incident upon a vertical surface of any orientation or upon a horizontal surface, even allowing for ground reflectances and obstructions on the horizon.

Early in 1954 work was started at the Laboratory on a study of heat flow through skylight fenestration, under the guidance of the TAC on Heat Flow Through Glass, R. A. Miller, chairman. The research was prompted by the rapidly increasing use of skylighting in single-story schools and similar buildings.

Tests were made by D. J. Vild on prismatic and diffusing-type glass block skylight units. Work was also done on the performance of slat-type skylight shading devices.

Experimentation on the shading of vertical sunlit glass was completed, but some analytical work still remains to be done. A final paper, Convection and Radiation Gain from Windows with Slat-Type Sunshades, is being prepared.



Test house located on roof of Engineering Bldg., University of California, Los Angeles, for studying thermal circuit techniques applied to heating and cooling problems

During the extended studies at the Laboratory on the transmission of solar radiation through glass, a great mass of data has been compiled. One paper analyzing some of these data, Irradiation of Vertical and Horizontal Surfaces by Diffuse Solar Radiation from Cloudless Skies, by Mr. Parmelee, was presented in June, and two other papers are in prospect. One of these will be on the combined effect of low-velocity forced convection and coincident thermal convection on the surface conductance of a smooth plate. The other will be on the calibration of pyrheliometers.

During 1955 research will continue on the performance of shading devices used with skylight fenestration. Skylights of plastic materials are to be investigated. The performance of flat-glass skylights will be predicted from data collected in earlier research.

In the skylight program a correlation will be sought between light transmittance and solar heat gain. Such a correlation would permit the prediction of heat gain through other fenestrations from more readily determined data on light transmittance.

Heat Pump

The TAC on the Heat Pump, E. P. Palmatier, chairman, is interested in solar radiation as a heat source for heating structures with heat pumps. Information on means of collecting the available solar energy is desired. The solar heat absorber may be an alternate to ground coils, wells and air as a heat source.

Solar-Energy Absorber Studies (University of Minnesota): Under a previous cooperative contract with the University of Minnesota for a study of Solar Energy as a Heat Source for the Heat Pump, it became evident that there was a serious lack of data on the design and performance of solar-energy collectors. A new cooperative agreement was executed early in 1954 to develop data on this subject.

Work under this contract has proceeded under the direction of R. C. Jordan in three areas as listed:

1. Construction and instrumentation of solar absorbers for field tests.
2. Pyrheliometer studies of solar radiation intensities on horizontal and vertical surfaces.
3. Theoretical studies of cloudless day radiation.

Construction and instrumentation of the collectors is essentially completed. During 1955 field data will be collected and compared with the results of analytical studies.

Two Epply pyrheliometers were obtained and were calibrated at the ASHAE Research Laboratory. Mountings for the instruments have been completed, and readings of solar radiation intensities on horizontal and vertical surfaces will be made during 1955.

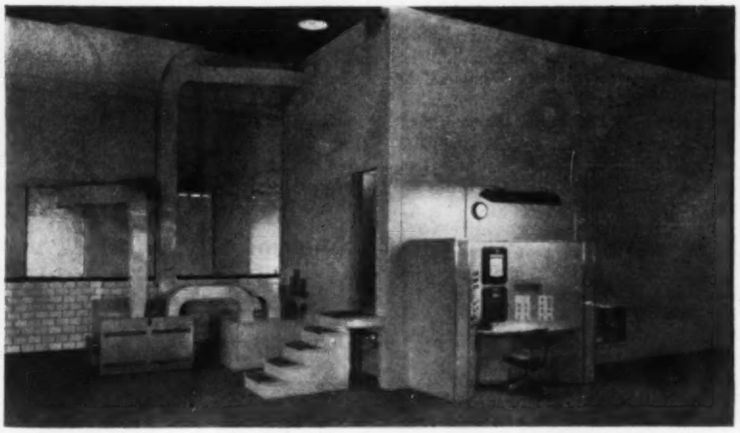
Theoretical studies of cloudless day radiation have been completed, and a paper giving the results of the work, Solar Radiation during Cloudless Days, by J. L. Threlkeld and Professor Jordan, was presented at the 1955 Annual Meeting. The paper includes the values of solar radiation over the year for different latitudes.

Heating Load

Infiltration as a factor in heating and cooling loads has not been accurately measured because of limitations in available instrumentation. Progress is being made on promising new techniques which will restore interest in the subject and provide better design data.

Study of Infiltration in a Residence Using the Tracer-Gas Technique (University of Illinois): Some time ago it was proposed that infiltration be studied by measuring the rate of decline in concentration of a tracer gas, such as helium, introduced into a room or building. A gas analyzer was purchased for this purpose by the Laboratory, and was checked by the Bureau of Standards.

The instrument has been installed in the Warm Air Research Residence No. 2, a modern one-story house at the University of Illinois. Tests will be made during the 1954-55 heating season under a variety of weather conditions. Infiltration rates, as determined by the rate of decay of helium content, are to be correlated with the indoor-outdoor pressure differential.



General view of exterior of ASHAE Environment Laboratory, Cleveland, constructed for development of authentic data for design and installation of panel heating and cooling systems

Hot Water and Steam Heating

Hot water and steam heating continues to be one of the popular fields of research interest, with several active projects under way. Included under the guidance of the TAC on Hot Water and Steam Heating, John W. James, chairman, are four projects on noise in piping, gas in hot-water systems, and the metastable state of water.

Noise in Piping Systems (Northwestern University): Many contractors have had the unfortunate experience of installing a heating system which, for some unexplained reason, was noisy and, therefore, unsatisfactory to the owner. To learn more about the cause and transmission of noise in piping, a cooperative research project on the subject was undertaken under the direction of W. L. Rogers.

As reported in 1953, the instrumentation has been developed to measure sounds in the water and in the air. In 1954 the results of tests were reported on sound made with a 20-ft. test section of 1-in. pipe, with flow through pipe, orifices, elbows and valves. The effect of water pressure was insignificant except possibly at the onset of cavitation. Noise levels increased with flow velocity, and sound waves from the pump were transmitted greater distances in the water than was evident to the ear.

Since the presentation of the second paper, additional testing has been done at higher temperatures and an additional pipe size.

The focus of the investigation to date has been on the sources of noise produced in flowing water, both pump and flow noises. Resonance conditions which can amplify the sound will be observed. Then methods of damping (attenuation) and of transmitting the sound to structures and air (coupling) will be investigated.

Metastable State of Water (Northwestern University): For any given pressure, there is a definite temperature at which water will normally boil. However, under certain conditions, such as by deaeration and careful heating in smooth glass vessels, it is possible to heat water up to 20 deg above its normal boiling temperature at atmospheric pressure before boiling starts. The boiling is then rapid, even violent, until the normal boiling temperature is reestablished.

The first step in the project was to demonstrate that water exists in a metastable state. This was first shown in a glass vessel, and by gradually reducing the pressure during heating, the condition was also produced at lower magnitude in a metal vessel with a smooth inner surface. Jarring the vessel produced minor pressure rises indicative of the disturbance of the metastable condition.

It is too early to establish whether the metastable condition can be reproduced in larger metal vessels to be a factor in boilers, but the investigation is continuing under the direction of B. H. Jennings.

Air Entrainment in Hot-Water Heating Systems (University of Florida): The entrainment of air or other gases in horizontal runs of piping was demonstrated in a convector system of a University dormitory. The gas was vented through automatic air vents.

The investigation is being continued in the laboratory with a complex piping system and convectors to determine whether entrainment could be used to carry the gas back to the boiler, where it could be separated from the water and put into the compression tank. J. D. Simonds is in charge.

Venting of Hot-Water Heating Systems (University of Illinois): A study of venting of hot-water heating systems is being made by W. S. Harris at the University of Illinois under a cooperative research contract signed in July 1954. The objectives of the project are to investigate the factors affecting (1) the formation of gas, (2) the separation of gas from the water in a one-pipe forced-circulation hot-water heating system, and (3) the entrainment of gas by water as it moves through the system.

A test system has been constructed for the study and the calibration of flow meters, and other instrumentation is essentially completed. Glass inspection sections are incorporated in the system to permit the observation of gas bubble formation and movement.

Tests will be made at various water temperatures, velocities and pressures under several different cycles of operation. Chemical analyses will be made of the water in the system and of the gases removed from it.

Human Calorimetry

Under the guidance of the TAC on Human Calorimetry, Professor Tuve, chairman, the ASHAE Research Laboratory Constructed and tested a human calorimeter for the Naval Medical Research Center at Bethesda, Md.

The equipment has been moved to and installed at the Center under the direction of Mr. Huebscher, who is on leave of absence from the Laboratory for the purpose of assisting the staff there until September 1955. The TAC plans to hold a meeting at the NMRC in 1955 to observe the performance of the calorimeter and to review the test results.

Industrial Environment

Design of Local Exhaust Ventilation for Hot Industrial Processes (University of Pittsburgh): The objective of the project, under the direction of Theodore Hatch and the guidance of the TAC on Industrial Environment, P. J. Marschall, chairman, is to relate the volume and pattern of the convected air stream arising from a hot body with the rate of heat release, surface temperature and physical dimensions of the body. The relation between the convection flow and the requirements of exhaust ventilation for canopy and lateral hoods is also to be determined.

Progress on this difficult project was reported in 1953, but no definite results have been reported for 1954.

Insulation

Under the guidance of the TAC on Insulation, M. W. Keyes, chairman, Mr. Vild of the Laboratory staff collected thermal-conductivity data (*k* factors) on insulating materials for THE GUIDE. The TAC reviewed the data and prepared tables of recommended design values for use when calculating heat transfer through building materials and pipe insulation materials. These tables are included in THE GUIDE, 1955.

The TAC expects to recommend to the Laboratory that new tables of *U* values be computed for THE GUIDE, 1956, based on standard and modern types of wall construction and the new *k* values.

Odors

A study of odor problems, including the formation, methods, of measurement and control, and the physiological reactions to them is the objective of the TAC on Odors, T. H. Urdahl, chairman.

The project on the effect of temperature and humidity on the perception of odors was begun in July with Mr. Kerka conducting the tests under the direction of Mr. Humphreys. The twin test rooms, 8 x 12 ft, and corridor, 4 x 12 ft, were equipped with air conditioning to provide a controlled temperature range of 45-110 F and relative humidities of 20-90 percent. Instrumentation was provided, as were means for introducing known amounts of odorants to the ventilating air.

After training a panel of staff members to observe odor intensity and quality, tests were conducted with three odorants over a range of air humidities and temperatures. Odor intensity is graded (0) not perceptible, (1) threshold of perception, (2) definite odor, (3) strong, and (4) overpowering.

Preliminary observations showed that air temperature had a minor effect, probably because the air temperature was brought to near the same value on entering the nostrils. Absolute humidity had a significant effect, the higher humidities causing a reduction in observed odor intensity.

Quantitative verification of the adaptation to odors in a few minutes by human subjects was also obtained by noting the decline in intensity of odor perception with time of exposure. Constant odor intensity was maintained in the room.

Plans have been made to measure odor adsorption by room furnishings, such as rugs, drapes and wall coverings. Effect of ventilation, temperature and humidity in removal of odors will also be studied.

Ventilation Requirements for Cigarette Smoke (Harvard School of Public Health): A paper on the above subject was prepared by C. P. Yaglou and presented at the 1955 Annual Meeting. The paper describes the atmospheric conditions in a room and the effects on occupants with ventilation rates of 6 to 60 cfm per smoker. Under the conditions of test, at 35 cfm per smoker the air and odor level was acceptable to all but a few observers. At 60 cfm ventilation per smoker the odor was only slightly perceptible.

Panel Heating and Cooling

Several years ago a special room was constructed in the ASHAE Research Laboratory for the study of heat transfer with a panel-heated space. The room measured 12 x 24.5 ft and had a ceiling adjustable to any height up to 12 ft. Numerous papers have resulted from the program in this Environment Laboratory, and the program is scheduled for completion in the spring of 1955.

At the June meeting, Mr. Schutrum reported that the effects of room size on the performance of floor and ceiling panels are relatively small. Also, within limits ceiling and floor panels comprised of heated and unheated sections have the same total heat output and produce the same room air temperature as if the entire area were heated to a uniform temperature equal to the area-weighted average of the heated and unheated surfaces.

In a preliminary paper on a cooled ceiling panel, L. F. Schutrum, John Vouris and T. C. Min have reported on the heat exchanges with the room. They have shown that ceiling cooling is the inversion of floor-panel heating, and that the results of the former can be predicted from the latter. An appreciable amount of sensible heat can be removed by a cooled ceiling panel held above the dew point, and the temperature gradients of the room air are low.

Incidental to the study, measurements of angular emissivity of heat from painted surfaces, oxidized metals and roofing asphalt were made and reported. Emissivities were found to remain nearly constant for angles up to 50 deg from perpendicular to the surfaces, beyond which the surface emissivities decreased.

Work will be in progress by Messrs. Schutrum and Min to investigate the effect of ceiling-panel cooling with lights and internal heat sources in the room, the effect of ceiling height, and the influence of cooled air introduced through a wall register and ceiling diffusers.

A paper has been drafted on design procedures for ceiling panels, and one is being written for floor panels.

The research has had the guidance of the TAC on Panel Heating and Cooling, P. B. Gordon, chairman, and four subcommittees.

Physiological Research

As long as the air-conditioning engineer is concerned with the design of systems to promote human comfort, he will continue to need information on the body's reactions to its environment.

The TAC on Physiological Research, M. K. Fahnestock, chairman, has organized a program to study non-uniform environments and their effects on human comfort, physiological response, stress and working efficiency. The effects of radiation, draft and sudden changes in temperature and humidity are among the factors of interest.

Physiological Research (University of Illinois Medical School): The paper, Physiological Responses to Sudden Changes in Atmospheric Environment: Studies of Normal Subjects, Obese, Hyperthyroid and Hypothyroid Patients, by Tohru Inouye, F. K. Hick, R. W. Keeton and Lionel Bernstein, presented in June, completed the project with important findings.

Three groups of obese, hyperthyroid, and hypothyroid women who might logically have an abnormality of body-temperature regulation were studied during tests, each consisting of one hour in a comfortable room, then for one hour in a hot humid room, and for an hour on return to the comfortable room.

In general, the promptness and ease of their thermal adjustments on entering the hot room confirmed the findings on normal women. Interesting differences in the responses of the groups were also noted.

Plant and Animal Husbandry

The possibilities of air conditioning on plant and animal growth and product yields have hardly been touched. Possible increases of several hundred percent in tomato yields were indicated by the Earhart Plant Research Laboratory in the paper, Effects of Air Conditioning on Plant Growth, by F. W. Went, given at the Annual Meeting in 1954.

The TAC on Plant and Animal Husbandry, A. J. Hess, chairman, is considering the scope of the subject which would be appropriate to the Society and is expected to suggest programs in the near future.

Sensations of Comfort

The classical work of Houghton and others has been discussed by the TAC on Sensations of Comfort, C. S. Leopold, chairman, with a view toward new studies. The effect of radiation, air velocity, temperature and humidity is to be investigated at the Laboratory when the Environment Laboratory is available. Two psychrometric rooms will be provided by partitioning the present room.

Sorption

Dynamic Characteristics of a Solid Adsorbent (Pennsylvania State University): Although the ability of certain adsorbent materials to remove moisture from air is known and utilized by engineers, very little basic information regarding the physics of sorption is available.

A method of determining and expressing the performance characteristics of a solid adsorbent was developed. The basic factors of practical sorbent processes were investigated experimentally, and the results were expressed graphically and in equations. The results, including sample calculations, were reported by Ross and McLaughlin in a technical paper to be presented in coming months.

The TAC on Sorption, headed by G. L. Simpson, guided the program.

Sound and Vibration Control

The TAC on Sound and Vibration Control, H. A. Lockhart, chairman, is interested in the development of information that will assist the engineer in avoiding noise problems in heating and air-conditioning systems. The committee has accepted with slight modification the outline of research problems recommended by the Engineering Subcommittee of the *National Fan Manufacturers Association.*

H. C. Hardy of Armour Research Foundation submitted a paper on instrumentation and measurement of sound which outlines projects from which a selection can be made.

Weather Data

The design of a heating or air-conditioning system is invariably based on some design weather conditions. The more realistically these design conditions can be selected, the more economically the system can be designed and the better it is likely to function.

The TAC on Weather Data, John Everetts, Jr., chairman, has surveyed the use of weather data by hundreds of engineers. It is also in touch with the Weather Bureau and the armed services to develop a program for obtaining the weather data needed by the profession.

Summary of Chapter Meetings

• *ATLANTA*: The January meeting, presided over by Pres. J. M. Lazenby, featured a film of *Football Highlights of the Georgia Institute of Technology* 1954 season. Attendance 54.

• *CINCINNATI*: Looking forward to the 1956 Annual Meeting to be held in Cincinnati, E. J. Kramer, membership chairman, spoke in January in favor of a 1955 membership drive. C. P. Krantz, publicity chairman, reported that he is increasing his newspaper contacts and will eventually be able to obtain sufficient publicity for the Chapter.

E. F. Snyder, Jr., supervisor of control application, Commercial Division, Minneapolis-Honeywell Regulator Co., addressed the membership on the *Measurement and Control of Humidity*. A discussion of humidity problems followed. Attendance 45.

• *DELTA*: At a joint *ASRE*-ASHAE December meeting, Theodore Offner, technical papers chairman, introduced A. J. Hess, past president of *ASRE* and president, Hess-Greiner & Polland, Los Angeles. Speaking on *Trends in Air Conditioning and Refrigeration*, Mr. Hess emphasized future applications to animal husbandry and plant growth. He noted the general familiarity with comfort air conditioning for human beings, and pointed out that a great deal of work is also being done on the application of comfort and proper climatic conditions to the growth of dairy and other food animals, and various plants, such as grains and coffee.

The only business conducted was the election of J. S. Burke, J. M. Richardson, J. S. Adair, Theodore Offner and C. B. Gamble to the nominating committee. Attendance 51. Attendance ratio 0.21.

• *ILLINOIS*: E. R. Kaiser, director of research, addressed the December meeting on the work and objectives of the Committee on Research. Mr. Kaiser pointed out that the Committee is guided by some 20 technical advisory committees, representing all activities of the heating, ventilating and air conditioning industry.

Selection of Water Saving Means for Cooling Systems was the subject of a talk by R. A. Gonzalez, staff assistant to the general sales manager, Airtemp Division, Chrysler Corp., Dayton, O. Mr. Gonzalez covered the various methods used to cool refrigerating systems, explaining the advantages and disadvantages of each method. Attendance 111.

• *INDIANA*: The highlights of the design problems and their solutions in a six-year building program for the American States Insurance Co. Building were presented at the November meeting. W. F. Currise, field engineer, American Blower Corp., Indianapolis, and Richard Ellingsworth took over this assignment in the absence of the expected speaker. A conducted tour of the building gave detailed information on the design, installation and operation.

The business of the meeting included discussion of possible publication of a chapter paper. Attendance 37.

• *IOWA*: *Steam Traps at Work* was the subject of a film shown by H. R. Peterson, Yarnall-Waring Co., Philadelphia, Pa. at the December meeting. Following the film, Mr. Peterson traced new developments in steam traps and discussed various applications for impulse traps. Attendance 41.

• *IOWA*: *The basic principle of low temperature welding is that liquids will dissolve solids*, according to R. H. Groman, director of welding engineering, Eutectic Welding Alloys Corp., Flushing, N. Y. Introduced at the November meeting by Gerald Graai, Mr. Groman spoke on the subject of metal joining in the heating and ventilating industries, tracing the origin of low temperature welding. To be welded, Mr. Groman pointed out, two metals must attract each other in fusibility; sometimes it is necessary to add a third or more metals to accomplish the weld. He believes that reduced costs and greater strength, though not always immediately apparent, can be attained by the use of low temperature welding, because of no build-up of metal. Numerous questions following the talk indicated the interest of the members. Attendance 30.

• *KANSAS*: Pres. Charles Yoe read a letter in December from the Kansas City Chapter asking support for their effort to have the Annual Meeting held in Kansas City in 1960. It was decided to give the approval and good wishes of the Kansas Chapter to this effort.

Vice Pres. A. B. Newton introduced J. B. Killebrew, Killebrew Engineering Corp., St. Louis, Mo. who spoke on *Selecting the Right Heat Exchanger*. Attendance 28.

• *KANSAS*: E. R. Queer, Society treasurer, spoke in November on *The Use of Caves for Cold Storage*. Caves were used for storage of food and materials during World War II. A. B. Newton introduced the speaker.

H. M. Skalla, treasurer, reported on the treasury balance. Attendance 39.

• *MONTREAL*: Unanimous approval was given to the revision of the Montreal Chapter by-laws as presented at the November meeting.

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*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

Journal Section

Following the showing of a film, entitled *Towards a Uniform Plumbing Code,* R. Mondello, superintendent, Sanitary Inspection Division, Health Dept., City of Montreal, gave comments on the film in respect to the Montreal by-laws. Mr. Mondello informed his audience that the city's by-laws are under constant revision to keep up with new practice in plumbing installation and welcomed any suggestions in view of this effort. Attendance 90. Attendance ratio 0.29.

• *NEBRASKA*: After the reading by Pres. C. A. Goth of a letter from the Kansas City Chapter urging endorsement of that Chapter as host for the 1960 Annual Meeting, it was voted in December that such endorsement be given. A motion was also passed that arrangements be made to contact the convention committee of the chamber of commerce of Omaha to see if facilities are available in this city to accommodate a future ASHAE Annual Meeting.

The main feature of the evening was a tour of the Omaha Auditorium. Attendance 32.

• *NEW YORK*: Albert Giannini, program chairman, introduced the January speaker, W. P. Chapman, engineering sales service representative, National Tube Division, U. S. Steel Corp., Pittsburgh, Pa. Mr. Chapman discussed *Recent Research Developments in Snow Melting,* mentioning the factors affecting the heat required to keep outdoor surfaces free of snow in various cities. It was brought out that the locality with the coldest winter temperatures and heaviest snowfalls does not necessarily require the greatest heat output per sq ft of surface.

Pres. R. L. Stinard announced the appointment of the following chapter past presidents as a nominating committee: H. S. Johnson, chairman, C. F. Kayan, Ernst Graber, P. B. Gordon and J. E. Schechter. Attendance 75. Attendance ratio 0.16.

• *NORTH JERSEY*: *Natural Gas in New Jersey* was the subject of a discourse by J. B. Boniface, planning engineer, Public Service Corp., at the January meeting.

The amendment to the by-laws whereby the Board of Governors would consist of eight members was voted upon and passed without a dissenting vote. Attendance 62.

• *NORTHEASTERN OKLAHOMA*: A. J. Hess, president, Hess-Greiner & Polland, Los Angeles, gave an informative talk on *Trends in Air Conditioning and Refrigeration* at the January meeting. Mr. Hess covered present usages in refrigeration, types of systems and their applications, and the future of the industry.

Announcing committee appointments, Pres. J. T. McKinney listed the following chairmen: *Program*—R. L. Sigler; *Meeting Place and Calling*—J. D. Shaw; *Membership*—J. D. Ryan and *Publicity*—B. F. Purifoy. Attendance 29. Attendance ratio 0.46.

• *NORTHERN OHIO*: At the December meeting, Pres. D. E. Mannen introduced Harry Porter, *Cleveland Engineering Society,* who outlined the plans for the new Cleveland Engineering and Scientific Center.

A second speaker, Upshur Evans, executive director, Cleveland Development Foundation, presented a challenging talk on the Foundation's role in rebuilding slum areas in central Cleveland into modern industrial and commercial housing units.

President Mannen complimented Vice Pres. L. C. Burkes on the make-up and publication of the membership roster. Attendance 66.

• *WASHINGTON, D. C.*: Present at the December meeting were Pres. L. N. Hunter, A. V. Hutchinson, executive secretary, and D. T. Donovan, assistant secretary. C. S. Robins introduced President Hunter, who spoke on *The Rating of Heating Boilers.* Comparing different boiler ratings, he discussed the test conditions under which ratings are developed. Comments after the meeting indicated that President Hunter's talk had been extremely well received. Attendance 80. Attendance ratio 0.44.

APPOINTED TO ASHAE STAFF AT RESEARCH LABORATORY

Increased coordination of research with industry is assured by the Society with the appointment of T. B. Fenzel as industrial liaison representative of the Society's Research Laboratory, it has been announced by E. R. Kaiser, director of research.

Mr. Fenzel will assist in informing the industry of the progress being made at the Laboratory and bring back suggestions from industry which will help make the research programs more effective. He also will keep in contact with companies participating in the 23-project research program and visit the Society's chapters to keep them informed and receive their recommendations.

T. B. Fenzel
Cleveland, Ohio

A graduate of Baldwin-Wallace College, Cleveland, Mr. Fenzel received his industrial experience at Johns-Manville Sales Corp. after two years service in the U. S. Navy. He is married, the father of three children and resides in Olmstead Falls, Ohio.

A. E. HESS PROMOTED

A. E. Hess, ASHAE member who joined General Controls Co. of Glendale, Calif., as a sales engineer in March of 1944, has been appointed southwest regional manager with headquarters in Dallas, Tex.

Candidates for Membership

The Society's By-Laws require that all applications for membership or advancement are to be sent to the Executive Secretary and the names of applicants and their references shall be printed in the next issue of the JOURNAL of the Society, or mailed to all members. When the replies are received from references the Candidate's application shall be submitted to and acted upon by the Admission and Advancement Committee as soon as possible.

When the Admission and Advancement Committee has acted favorably upon a Candidate's application and assigned his grade, the Council shall confirm the election of the proposed Candidate for membership. During the past month there have been 99 applications for membership, including 8 students, 3 reinstatements; in addition 14 advancements have been received. The names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Admission and Advancement Committee, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Executive Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by March 31, 1955, these candidates will be voted upon by the Council. Those elected to membership will be notified by the Executive Secretary immediately after election.

Note: †Reinstatement. *Non-member. △Advancement.

California

△BEGGS, P. B., Br. Mgr., Paul W. Beggs & Son, San Francisco. REFERENCES: C. H. Bazille, E. C. Cooley, H. S. Haley, H. V. Hickman.

BLESSING, K. G., Distr. Repr., Worthington Corp., Los Angeles. REFERENCES: F. B. Gardner, E. W. Hammond*, M. M. Lawler*, E. R. Michel*.

HALL, J. C., Engr., Lester R. Kelly, Cons. Engr., Los Angeles. REFERENCES: K. M. Baker, J. T. Conway, Melvin Kodmur, W. M. Norton, Jr.

HILBURG, E. L., Partner, Hilburg, Hengstler & Turpin, Los Angeles. REFERENCES: A. J. Hess, M. C. Greiner, A. G. Small, R. C. Taylor.

KOVNER, ISIDORE, Mech. Engr., Kistner, Wright & Wright, Los Angeles. REFERENCES: W. D. Harrison, Bodan Horak*, E. B. Hilton, C. D. Walz.

SKINNER, J. A., Mgr. Heating Div., Dallman Co., Sacramento. REFERENCES: D. C. Benbow, D. R. Blanchard, H. F. Boothby, J. E. Day.

Colorado

WOLF, G. J., Repr., Colorado Springs Supply Co., Colorado Springs. REFERENCES: G. H. Binning, K. F. Ebey*, William Moore*, V. F. Vallero.

Connecticut

FIERBERG, I. M., Pres., The Morris A. Fierberg Co., Hartford. REFERENCES: R. W. Briggs, E. C. Marsden, J. F. Mueller, R. P. Tucker.

District of Columbia

DOLLAR, HENRY, Mech. Engr., General Engineering Assocs., Washington. REFERENCES: S. R. Allen, Charles Holladay*, F. E. McArdle, Morris Shapiro.

MCMANN, R. C., Comm'l. Sales Mgr., Minneapolis-Honeywell Regulator Co., Washington. REFERENCES: G. C. Asker, G. W. Campbell, R. A. Grant, H. E. Grossman.

PHILLIPS, A. F., JR., Mech. Engr., Dept. of the Navy, Washington. REFERENCES: Milton Berg*, A. E. DeSomma*, A. S. Gates, Jr., J. G. Muirheid.

Georgia

GAYLOR, J. R., Technician, Johnson Service Co., Atlanta. REFERENCES: J. M. Lazenby, Frank Player*, W. P. West, K. A. Wright.

Illinois

CULBERG, D. A., Vice-Pres., Culberg Asbestos & Cork Co., Chicago. REFERENCES: S. L. Haas, Herbert Kreisman, S. L. Lichtenfeld, E. R. Ross.

HESS, R. B., Sr. Engr., Neiler, Rich & Bladen, Chicago. REFERENCES: A. M. Bladen, H. G. Gragg, J. H. Milliken, L. O. Paul.

△KUREK, E. J., Supvsr., Multi-Vent Engrg., The Pyle-National Co., Chicago. REFERENCES: D. W. Day, M. K. Fahnestock, R. S. Geocaris, R. W. Van Valzah.

LAUX, J. M., Mgr., North-Town Refrigeration Corp., Chicago. REFERENCES: Robert Horan*, W. H. Kramer, B. C. Prather, T. J. Reedy*.

LO, H. B., Mech. Engr., Holabird & Root & Burgee, Chicago. REFERENCES: M. J. Bamond, C. M. Barnes, J. H. Gazlay, L. P. Lang.

SAUNDERS, I. R., Repr., A. A. Redderson, Chicago. REFERENCES: G. W. Bornquist, Jack Harris, M. H. Hoffmeister, W. H. Kramer.

UNGER, P. R., Partner, Mid-West Heat Service, Chicago. REFERENCES: R. E. Hattis, S. R. Lewis, H. S. Nachman*, A. J. Sander.

YOKE, W. R., Mech. Engr., Swift & Co., Chicago. REFERENCES: Chilton Albright*, R. C. Blackman, J. W. Bunning*, E. K. Emerson.

Iowa

△DAVIS, W. L., Pres., The Seither & Cherry Co., Keokuk. REFERENCES: W. D. Best, Joseph Kimmel*, George Loomis*, G. B. Supple.

Kansas

△ANDERSON, J. H., Mech. Engr., Williamson, Loebsack and Assoc., Topeka. REFERENCES: V. H. Loebsack, L. P. Moore, R. W. Tobey, C. E. Wagner.

Kentucky

BOHANNON, H. J., JR., Design Draftsman, Southern Engineering Co., Louisville. REFERENCES: W. J. Killian, J. W. May, R. W. Nelson, D. J. Rank.

CZERWONKA, L. J., Research Physicist, American Air Filter Co., Inc., Louisville. REFERENCES: J. M. Kane, J. W. May, H. J. Noles, Arthur Nutting.

MULLIGAN, J. R., Design Engr., American Radiator & Standard Sanitary Corp., Louisville. REFERENCES: R. B. Duggan, F. E. Hanson, L. L. Smith, B. M. Veath*.

SCHULER, D. A., JR., Deputy Chief Architect, Federal Housing Admin., Louisville. REFERENCES: H. L. Carr, J. W. May, W. M. Pace, J. B. Stinger.

THOME, R. J., Design Engr., American Radiator & Standard Sanitary Corp., Louisville. REFERENCES: R. B. Duggan, F. E. Hanson, L. L. Smith, J. B. Uhl.

TRUMBULL, M. E., Mgr., American Blower Corp., Louisville. REFERENCES: J. W. May, Arthur Nutting, J. D. Slemmons, H. E. Sproull.

WITTEN, W. J., JR., Design Engr., American Radiator & Standard Sanitary Corp., Louisville. REFERENCES: R. B. Duggan, F. E. Hanson, L. L. Smith, J. B. Uhl.

Louisiana

BRAITHWAITE, J. E., Assoc. Engrg. Designer, Metrailer & Ingram, Baton Rouge. REFERENCES: W. J. LeBlanc, A. J. Mayers, Jr., B. M. Payne, C. S. Woodruff.

CALAHAN, L. H., Estimator, Johns-Manville Sales Corp., Baton Rouge. REFERENCES: G. S. Cox, J. F. Naylor, W. I. Pol, C. S. Woodruff.

LEAVINES, J. E., Electrical Engr., Kaiser Aluminum and Chemical Corp., Baton Rouge. REFERENCES: D. E. Coughlin*, V. Forte*, H. D. Muse*, D. R. Wilson*.

Journal Section

Miller, W. J., Vice-Pres., Residential Heating & Air Conditioning Co., Inc., Baton Rouge. References: A. J. Mayers, Jr., B. M. Payne, H. J. Weilbacher, C. S. Woodruff.

△Stone, F. W., Jr., Chief Engr., Standard Inc., Baton Rouge. References: W. H. Dudley, Jr., W. B. Moses, Jr., H. N. Ogden, C. S. Woodruff.

Webb, J. L., Assoc., Bodman & Murrell & Smith, Architects, Baton Rouge. References: A. J. Mayers, Jr., J. F. Naylor, W. I. Pol, C. S. Woodruff.

Yoder, J. F., Jr., Pres., Residential Heating & Air Conditioning Co., Inc., Baton Rouge. References: A. J. Mayers, Jr., B. M. Payne, H. J. Weilbacher, C. S. Woodruff.

Massachusetts

Connelly, T. G., Mgr. Heating Div., Herrick Co., South Boston. References: D. W. Blair, F. A. Grossman, F. W. Legler, Thomas Terrio*.

Murphy, W. B., Asst. Treas., B. E. Crowley, Inc., Springfield. References: Leslie Grodsky*, Harry Hineman*, Theodore Loring*, John Reed.

Snyder, H. L., Chief Engr., Boston Filter Co., Inc., Charlestown. References: R. R. Forbes, L. B. Mann, J. M. Means, O. O. Theroux.

Michigan

Bennett, D. A., Sales Engr., Minneapolis-Honeywell Regulator Co., Detroit. References: J. E. Haines, J. S. Locke, J. H. Spitzley, C. A. Strand.

Strilcov, B. G., Sales Engr., F. W. Starrett Co., Detroit. References: L. F. Einheuser, H. M. Keyser, H. W. Perry, F. W. Starrett.

Winchester, Richard, Owner, Winchester's, Ann Arbor. References: J. H. Keller, R. M. McIntosh, Red Rogvoy*, Richard Wintroub*.

Minnesota

Brommer, D. A., Estimator, H. Conrad Mfg. Co., Minneapolis. References: J. R. Andrews, C. L. Bensen, J. A. Craig, F. E. Sneeberg*.

Missouri

Dicker, R. W., Engr., Edward W. Lochman Co., Kansas City. References: E. W. Lochman, Gustav Nottberg, Henry Nottberg, Jr., R. M. Spencer.

Gable, L. A., Mech. Engr., Black & Veatch, Kansas City. References: J. R. DeRigne, R. E. Hollasch, J. C. Robbins, A. J. Sneller.

△Zwiegel, F. J., Jr., A. D. Jacobson Plumbing & Heating Co., Kansas City. References: G. F. Hellmer, E. L. Jacobson, H. H. Lewis, Henry Nottberg, Jr.

New Jersey

Serafin, W. T., Repr., United States Radiator Corp., Harrison. References: A. L. Behrens, W. P. Klein, H. E. Perry, W. J. Sliney.

New Mexico

△Haines, R. W., Project Engr., Bridgers & Paxton, Cons. Engrs., Albuquerque. References: F. H. Bridgers, H. F. Munn, D. D. Paxton, J. H. Van Alsburg.

Whiting, D. G., Repr., Technical Service Co., Albuquerque. References: C. G. Davis, N. P. Gunter, H. F. Munn, E. P. Murr.

New York

Downey, M. J., Engr., Arctic Engineering Co., New York. References: Hugo Basch, R. W. DeBenham, Edward Klein, J. L. Page.

Ferris, R. F., Appl. Engr., Carrier Corp., New York. References: O. W. Armspach, Albert Giannini, J. G. Marshall, P. P. F. Reinisch.

†Norton, F. W., Estimator-Engr., Baker Smith & Co., New York. References: Benjamin Bacon*, R. H. Carpenter, W. M. Heebner, A. M. Ritter.

O'Heir, R. J., Tech. Dir., Perlite Institute, New York. References: L. A. Barron, R. L. Davis, H. E. Lewis, O. H. Storey*.

Roberts, W. H., Sr., Dvlpt. Engr., Carrier Corp., Syracuse. References: W. A. Grant, B. H. Jennings, E. F. Obert*, E. P. Palmatier.

△Seelinger, H. N., Project Engr., Voorhees, Walker, Smith & Smith, Long Island City. References: H. G. Junger, W. T. Kane, E. Schillinger*, D. J. Whealton.

North Carolina

Hopkins, V. M., Engr., The Moses H. Cone Memorial Hospital, Greensboro. References: J. E. Hart, Harry Hoffman, S. T. Oliver, W. H. Sullivan, Jr.

†Hopping, J. G., Jr., Industrial Engr., Piedmont Natural Gas Co., Inc., Charlotte. References: B. W. Dean, R. E. Mason, C. E. Petty, R. F. Taylor.

Still, J. T., Jr., Pres., J. T. Still Co., Inc., Raleigh. References: D. F. Bennett, N. W. MacNichol, L. H. Plum, L. L. Vaughan.

Ohio

Bennett, H. D., Partner, Howard D. Bennett, Levin & Assoc., Cleveland. References: C. R. Braun, Jr., Sherwood Nassau, W. M. Rogers, R. D. Wilson.

Clague, D. H., Repr., Surface Combustion Corp., Dayton. References: L. P. Brehm, Jr., W. R. Budde, F. S. Hamer, J. T. Trimble.

Cozzens, W. H., Sales Engr., F. O. Schoedinger, Inc., Columbus. References: H. A. Crawford, J. A. Guy, R. A. McGovern, C. A. Reichelderfer.

Craun, J. R., Repr., Craun-Liebing Co., Cleveland. References: D. S. Clark*, H. E. Degler, Nick Mahalic*, L. T. Mart.

Degler, C. W., Jr., Br. Mgr., Ilg Electric Ventilating Co., Cleveland. References: C. E. Brock, J. J. Friedler, Jr., Sherwood Nassau, B. G. Silberstein.

Favret, W. E., Sec'y., Williamson Favret Furnace Co., Columbus. References: A. D. Bogen, N. T. Hess, R. T. L. Keener, W. A. Schoonover.

△Guest, J. F., Partner, Skeldon Power Equipment Co., Toledo. References: F. A. Edgington, G. H. Frost, C. F. Hoffman, F. C. Richardson.

Haak, C. E., Draftsman, Fulton, Krinsky & DelaMotte, Cleveland. References: W. F. Blonchek, Sherwood Nassau, C. W. Pressler, W. M. Rogers.

Hartman, Robert, Engr., Home Furnace Co., Columbus. References: A. D. Bogen, J. A. Guy, N. T. Hess, J. D. Slemmons.

Hauck, W. A., Mgr., Heating Sales, Rex Supply Co., Cleveland. References: C. M. Baumgardner, R. G. Harrison, J. W. LeRoy, W. W. Lige.

Hrubecky, E. J., Repr., American Radiator & Standard Sanitary Corp., Cleveland. References: William Bullock*, R. G. Harrison, W. W. Lige, John Richmond.

Hunting, W. A., Head, Mech. Engrg., The Austin Co., Cleveland. References: H. R. Canoyer, R. E. Leising, D. L. Taze, R. D. Wilson.

Lautanen, G. H., Mech. Engr., Fulton, Krinsky & DelaMotte, Cleveland. References: F. A. Kitchen, Sherwood Nassau, W. M. Rogers, A. R. Textor.

Levin, Joseph, Partner, Howard D. Bennett, Levin & Assocs., Cleveland. References: C. R. Braun, Jr., Sherwood Nassau, W. M. Rogers, R. D. Wilson.

Mitchell, W. P., Sales Engr., Home Furnace Co., Columbus. References: A. D. Bogen, F. W. Gurley, J. A. Guy, A. F. McGovern.

Monnin, H. J., Jr. Engr., Frigidaire, Dayton. References: W. D. Banks, D. L. Bergman, R. J. Perkins, C. D. Weaver, Jr.

O'Brien, E. P., Design Engr., Howard D. Bennett, Levin & Assocs., Cleveland. References: D. B. Johnsen, F. H. Pasiadas, G. R. Shilling, R. D. Wilson.

Rosenblum, Lawrence, Sr. Engr., George Koch Sons, Inc., Portsmouth. References: F. E. Hares*, L. A. Kadel*, Bernard Kaplan, B. W. Witherspoon.

Schmidlin, O. F., Secy., Schmidlin Bros. Heating Co., Toledo. References: F. A. Edgington, J. F. Guest, L. B. LaFrance, F. C. Richardson, Jr.

Vogan, M. W., Repr., Schemenauer Mfg. Co., Holland. References: R. H. Abbenzeller, G. L. Heiser, W. H. Kahl, J. E. Wenzel.

†White, J. A., Sales Engr., Carrier Corp., Cleveland. References: J. H. Bailey*, J. F. Krohn*, R. E. Leising, T. A. Weager, Jr.

Oregon

Day, C. R., Pres., Day-York Distributors, Portland. References: Dick Blankenship, W. B. Hayes, A. N. Hoss, W. R. Pindell.

Rhoads, J. D., Draftsman, Brod & McClung, Portland. References: Dick Blankenship, C. F. Ingham, T. H. McClung, W. B. Morrison.

Swan, S. F., Office Mgr., H. W. McKenzie Co., Portland. References: G. C. Day, E. E. Kelly, H. W. McKenzie, R. L. Schroeder.

Pennsylvania

Bausman, Sanford, Pres., Aircon & Heating Supply Co., Inc., Pittsburgh. References: E. J. Busch, W. E. Keist, J. C. Reynolds, J. N. Riley.

Buzzard, R. F., Sales Engr., John J. Nesbitt, Inc., Philadelphia. References: R. H. Ackermann, F. H. Buzzard, John Everetts, Jr., H. B. Hedges.

Dodson, J. R., Jr., Cons. Engr., Pittsburgh. References: E. C. Hach, B. H. Prack*, N. S. Stake, F. T. Wadlow*.

Goodridge, William, Field Supt., Johns-Manville, Pittsburgh. References: B. A. Allen*, A. W. Marshall, T. F. Rockwell, R. B. Stanger.

Hoffman, P. M., Vice-Pres., S. S. Fretz Jr., Inc., Philadelphia. References: M. F. Blankin, F. C. Dietz, J. R. Ellstrom, F. B. Millham.

Lankes, E. F., Foreman, George F. Kurtz, Pittsburgh. References: J. G. Beres, G. F. Kurtz, N. W. Rainey, O. L. Williams.

Marano, A. S., Engr., Hajoca Corp., Philadelphia. References: R. W. Cromie, J. P. Hartmann, J. C. Ickeringill, J. O. Kirkbride.

McMahon, J. M., Design Engr., T. F. Rockwell, Cons. Engr., Pittsburgh. References: G. W. Cost, R. M. McIntosh, T. F. Rockwell, N. S. Stake.

Meucci, R. M., Design Engr., T. F. Rockwell, Cons. Engr., Pittsburgh. References: Edward Claitman, G. W. Cost, T. F. Rockwell, N. S. Stake.

Mullin, J. W., John W. Mullin and Assocs., Pittsburgh. References: C. L. Benn, E. C. Hach, E. C. Smyers, N. S. Stake.

Poole, R. T., Project Engr., Smith, Kline and French Laboratories, Philadelphia. References: W. A. Bornemann, Conrad Kramer, H. D. Lowrey*, H. M. Parent.

Quinn, B. B., Project Engr., Carrier Corp., Philadelphia. References: W. A. Bornemann, L. M. Church, E. H. Dafter, B. P. Morabito.

Sardon, J. C., Mech. Designer, James R. Dodson, Jr., Cons. Engr., Pittsburgh. References: J. R. Dodson, Jr.*, E. C. Hach, B. H. Prack*, N. S. Stake.

South Carolina

Bettis, F. A., Sales Engr., R. K. Rouse Co., Greenville. References: J. W. Rockwell, R. K. Rouse, R. A. Stipp, J. E. Waldrep.

Bruce, H. A., Sales Mgr., Iron Fireman Corp., Greenville. References: F. W. Freeman, E. R. McDaniel*, R. K. Rouse, R. A. Stipp.

△McDowell, H. L., Vice-Pres., W. O. Blackstone & Co., Inc., Columbia. References: R. F. Donovan, R. K. Rouse, L. L. Vaughan, W. M. Wallace, II.

Tennessee

Dooley, J. M., Owner, John M. Dooley & Assocs., Knoxville. References: W. S. Browning, J. R. Collette, C. E. McCallum, W. L. Montgomery.

Solomon, R. L., Design Engr., E. I. DuPont de Nemours & Co., Chattanooga. References: Mario Bianculli*, J. C. McKee*, George Palm*, R. C. Snoeberger.

Tuten, J. G., Jr., Sales Engr., The Trane Co., Chattanooga. References: D. G. Carter, R. O. Goodman, C. E. McCallum, C. A. Spears, Jr.

Texas

Hollingsworth, J. B., Vice-Pres., F. R. Young Co., Houston. References: H. W. Broadwell, W. A. Jackson, I. A. Naman, F. R. Young.

Reedy, M. T., Service Engr., Minneapolis-Honeywell Regulator Co., Houston. References: C. D. Adams, Jr., H. G. Kerbow, D. I. Wilhelm, W. H. Willson*.

Utah

△Baker, E. L., Owner, Salt Lake City. References: S. J. Jesperson, A. P. Robertson, W. L. Stuewe, G. E. Wright, Jr.

Virginia

Smith, H. E., Vice-Pres., Shultz & James, Richmond. References: T. B. Carpenter, C. G. Conaway, Jr., D. C. Delinger, V. A. Moore.

Washington

△Bickel, H. A., Engr. in charge, Johnson Service Co., Spokane. References: A. B. Hess, L. E. Marque, G. C. Murray, K. M. Wood.

Hettinger, K. A., Dist. Mgr., Arthur Forsyth Co., Spokane. References: E. W. Bunnell, R. L. Carlson, W. N. Pauley, R. E. Shanks.

△Owens, D. F., Repr., The Trane Co., Seattle. References: J. B. Notkin, N. H. Peterson, S. D. Peterson, G. S. Troberg.

Severin, C. E., Repr., Johns-Manville, Spokane. References: L. D. Daniels, F. W. Jenkinson, J. R. Morris, K. M. Wood.

Wisconsin

Wilson, K. M., Chief Engr., E. F. Klingler & Assoc., Eau Claire. References: C. E. Bronson, A. A. Dovenmuehle, G. M. Kendrick, W. B. Russell.

Canada

Brousson, D. M., Mgr., Century Sales, Ltd., Vancouver, B.C. References: F. D. Bolton*, J. C. McAdam, D. W. Thomson, S. W. Welsh.

Fortier, J. L., Draftsman, Jas. P. Keith & Assocs., Montreal, Que. References: E. J. Gilbert, James Keith, M. H. Kert, H. J. Mattocks.

Gravel, J. E., Supvsr., The Ventilating & Blow Pipe Co., Ltd., Montreal, Que. References: W. G. Hole, B. J. Horsburgh, D. J. McIntyre, G. H. Osborne.

Hayes, Ronald, Repr., The James Robertson Co., Ltd., Montreal, Que. References: L. J. Greenough, Allan Grey*, D. F. MacDonald, J. S. Massiah.

Smiley, D. C., Engr., Dept. of Public Works, Ottawa, Ont. References: H. G. Conn*, C. M. R. Elmsley*, W. J. Robinson, H. H. Stewart*.

New Zealand

△Jones, A. L., Tech. Mgr., Heat and Air Control, Ltd., Auckland. References: W. L. Cooke, E. M. Taylor, George Vamos, H. A. L. Vale.

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OBITUARIES

WILLIAM MALLIS
Seattle, Wash.

William Mallis, 71, senior member of Mallis and DeHart, Architects, died on December 19, 1954. A Life Member of the Society, Mr. Mallis had recently attended an Old Timer's Nite given by the Pacific Northwest Chapter.

Born on June 29, 1883 in Auchterarder, Scotland, Mr. Mallis entered the architectural field in 1900 when he began a five-year apprenticeship with Maclaren & Mackay, Perth, Scotland, learning drafting, design, construction and supervision. After joining J. H. Felt & Co., Kansas City, Mo. in 1908, he worked as an engineer, designing heating and ventilating plants in numerous high schools and William Jewell College, Liberty, Mo. Later, he went into business both on his own and in association with fellow architects.

The Officers and Council of the Society extend their condolences to his widow, Jennie D. Mallis.

HOMER J. TILLEY
Los Angeles, Calif.

The Society has learned of the recent death of Homer J. Tilley, vice president and general manager, F. B. Gardner Co., Inc., Los Angeles. He was a member of the Society since early 1950.

Born in Stockton, Calif. on May 21, 1898, Mr. Tilley was educated in San Jose. He began his career in his father's plumbing and heating business. For some 25 years, he engaged in industrial heating and ventilating in Southern California, joining F. B. Gardner Co. in 1945.

Mr. Tilley is survived by his widow, Ann J., who resides in Glendale, Calif.

PAUL J. VINCENT
Baltimore, Md.

Paul J. Vincent, a member of the Society since 1931, died suddenly at his home on January 5, 1955 at the age of 59. Mr. Vincent was president and general manager of his own engineering and contracting firm, the Paul J. Vincent Co., Baltimore, Md.

He was born in Baltimore on September 26, 1895, and attended Calvert Hall and Rock Hill Colleges, receiving his B.S. in 1916. Mr. Vincent also attended the U. S. School of Technology and Johns Hopkins University. Holding various engineering positions, he was associated with Baugh Chemical Co., L. Grief Bros. and Empire Refrigerating Machinery Co. In 1923 he joined Chatard & Norris, Baltimore, as engineer in charge of the refrigerating and engineering department, and remained in that capacity for several years previous to opening his own company in 1931. He was a pioneer in theater air conditioning.

A past president of the Mechanical Contractors of Baltimore, he also held membership in *ASME*, *ASRE* and the Engineering Club of Baltimore. Surviving are his wife, Margaret Donohue Vincent; a brother, William Starr Vincent; and a sister, Sister Mary Claudine, of the Notre Dame Order.

ALBERT E. VROOME
New York, N. Y.

Albert E. Vroome, 57, mechanical engineer, Ebasco Services, Inc., Shreveport, La. died on November 9, 1954. He had been a member of the Society since 1932.

Mariners Harbor, N.Y. was the site of his birth on June 7, 1897. After receiving his high school education in Caldwell, N. J., Mr. Vroome attended Cornell University. In 1919 he began his career as a draftsman and engineer on mechanical equipment of buildings with Louis E. Eden, consulting engineer, New York City. Following several years in this connection, he joined Simon & Simon, architects, Philadelphia, Pa., as a mechanical engineer. For over 13 years previous to his death, Mr. Vroome was associated with Ebasco Services.

The Officers and Council of the Society have extended their sympathy to his widow.

HENRY A. ZANONE
Louisville, Ky.

Word has been received of the death of Henry A. Zanone on December 11, 1954 at 66. A member of the Society for over 11 years, Mr. Zanone had spent most of his active life in the industrial heating and plumbing business in Louisville, Ky., engaging in design, estimation, contracting and installation.

On July 13, 1888, he was born in Cincinnati, O. He attended school in Louisville. For 20 years he acted as manager, H. A. Zanone & Sons, and then beginning in 1938, he served for several years as superintendent of plumbing & heating, Commonwealth of Kentucky. He maintained a consulting office, the Zanone Engineering Co., in Louisville since 1946.

Registered as a professional engineer in Kentucky and Indiana, Mr. Zanone was a member of the *Kentucky Society of Professional Engineers* and the Engineers' and Architects' Club in Louisville. He is survived by his son, Edwin Glenn, who is an ASHAE member.

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- **ARKANSAS:** 1952. Hdqrs., Little Rock, Ark. Meets, 3rd Tues. PRES., W. J. Franklin, 608 W. Third St. SECY., J. W. Thompson, 1314 Main St.
- **ATLANTA:** 1937. Hdqrs., Atlanta, Ga. Meets, 2nd Mon., PRES., J. M. Lazenby, 8 11th St., N.E. SECY., F. W. Bull, 1205 Spring St., N.W.
- **BALTIMORE:** 1949. Hdqrs., Baltimore, Md. Meets, 3rd Wed. PRES., E. H. Taze, 33 E. 21st St. (18). SECY., R. F. Weisman, 4650 Reisterstown Rd. (15).
- **BLUEGRASS:** 1954. Hdqrs., Louisville, Ky. Meets, 2nd Mon. PRES., J. W. May, 215 Central Ave. SECY., A. E. Hausmann, 227 Lowell Ave., Charlestown, Ind.
- **BRITISH COLUMBIA:** 1952. Hdqrs., Vancouver, B.C., Canada. Meets, 2nd Wed. PRES., S. C. Gale, 1628 W. 4th Ave. SECY., D. A. English, 1606 W. 1st Ave. (9)
- **CENTRAL NEW YORK:** 1944. Hdqrs., Syracuse, N. Y. Meets, 4th Wed. PRES., F. D. Putnam, 115 Pulsifer Dr., Auburn. SECY., Merle Weninger, 230 Goodrich Ave. (5).
- **CENTRAL OHIO:** 1944. Hdqrs., Columbus, Ohio. Meets, 3rd Mon. PRES., J. A. Guy, 478 W. Fifth Ave. (1). SECY., W. A. Schoonover, 2901 N. High St. (2).
- **CINCINNATI:** 1932. Hdqrs., Cincinnati, Ohio. Meets 1st Tues. PRES., F. W. Wilson, 222-24 E. 14th St. SECY., R. G. Anderson, 1758 Elmore St. (23).
- **CONNECTICUT:** 1940. Hdqrs., New Haven, Conn. Meets, 3rd Thurs. PRES., C. L. L'Hommedieu, 76 Blatchley Ave. SECY., Walter Heywood, 1007 Farmington Ave., West Hartford.
- **DELTA:** 1939. Hdqrs., New Orleans, La. Meets, 3rd Tues. PRES., C. V. Bankston, 2927 Jackson Ave. (25). SECY., W. B. Martin, Jr., 314 St. Charles Ave. (12).
- **EMPIRE STATE CAPITAL:** 1951. Hdqrs., Albany, N. Y. Meets, 2nd Wed. PRES., E. C. Doyle, 315 Washington Ave. SECY., H. F. Kruger, 501 Seventh Ave., Troy.
- **GOLDEN GATE:** 1937. Hdqrs., San Francisco, Calif. Meets, 1st Thurs. PRES., Eric Roberts, 417 Market St. SECY., F. K. Crouch, 906 Cerrito St., Albany (6).
- **ILLINOIS:** 1906. Hdqrs., Chicago, Ill. Meets, 2nd Mon. PRES., G. V. Zintel, 840 N. Michigan Ave. (11). SECY., H. G. Gragg, 228 N. LaSalle St. (1).
- **INDIANA:** 1943. Hdqrs., Indianapolis, Ind. Meets, 4th Tues. PRES., P. O. Patterson, 6300 N. Oakland Ave. (20). SECY., A. O. Roche, Jr., 3950 Broadway (5).
- **INLAND EMPIRE:** 1950. Hdqrs., Spokane, Wash. Meets, 1st Mon. PRES., H. A. Bickel, E. 7 Riverside Ave. SECY., Max Tonn, S. 4021 Latawah St.
- **IOWA:** 1940. Hdqrs., Des Moines, Ia. Meets, 2nd Tues. PRES., W. E. Nanes, 220 Davidson Bldg. SECY., D. E. Schroeder, 2717 Cambridge.
- **KANSAS:** 1951. Hdqrs., Wichita, Kan. Meets, Tues. after 1st Mon. PRES., Charles Yoe, P.O. Box 2239. SECY., T. L. Roberts, 2008 S. Parkwood Lane.
- **KANSAS CITY:** 1917. Hdqrs., Kansas City, Mo. Meets, 1st Mon. PRES., F. K. Ladewig, 3527 Broadway (11). SECY., R. M. Spencer, 1510 Main St. (8).
- **MANITOBA:** 1935. Hdqrs., Winnipeg, Man., Canada. Meets, 4th Thurs. PRES., G. T. Christie, Midland & Notre Dame. SECY., A. J. McIntyre, 935 Garwood Ave.
- **MASSACHUSETTS:** 1912. Hdqrs., Boston, Mass. Meets, 3rd Tues. PRES., G. W. Sprague, 108 Cummington St. SECY., W. G. Burbo, 137 Newbury St. (16).
- **MEMPHIS:** 1944. Hdqrs., Memphis, Tenn. Meets, 3rd Mon. PRES., A. W. Shelby, 972 Union Ave. SECY., A. T. Bevil, 1638 Union Ave. (4)
- **MIAMI VALLEY:** 1950. Hdqrs., Dayton, Ohio. Meets, 1st Wed. PRES., R. W. Kimmel, 320 Loneworth St. (2). SECY., J. B. Rishel, 656 Selma Rd. (9).
- **MICHIGAN:** 1916. Hdqrs., Detroit, Mich. Meets, 1st Mon. after 10th of month. PRES., E. F. Glanz, 1761 W. Forest Ave. (8). SECY., J. H. Spitzley, 1200 Fort St., W. (26).
- **MINNESOTA:** 1918. Hdqrs., Minneapolis, Minn. Meets, 1st Mon. PRES., J. A. Craig, 814 S. Ninth St. (4). SECY., E. T. Erickson, 500 Baker Arcade (2).
- **MISSISSIPPI:** 1953. Hdqrs., Jackson, Miss. PRES., J. E. Davis, Jr., P.O. Box 3216, West Jackson (7). SECY., L. H. Smith, 711 W. Capitol St.
- **MONTREAL:** 1936. Hdqrs., Montreal, Que., Canada. Meets, 3rd Mon. PRES., D. L. Lindsay, 4350 Sherbrooke St. (6). SECY., S. R. Plamondon, 2267 Melrose Ave. (14).
- **NEBRASKA:** 1940. Hdqrs., Omaha, Neb. Meets, 2nd Tues. PRES., C. A. Goth, 3115 N. 49th Ave. SECY., L. J. Paulsen, 1901 S. 39th St.
- **NEW MEXICO:** 1954. Hdqrs., Albuquerque, N. M. PRES., J. H. Van Alsburg, 1330 Cerro Gordo, Santa Fe. SECY., J. K. James, 4462 Avenida del Sol.
- **NEW YORK:** 1911. Hdqrs., New York, N. Y. Meets, 3rd Mon. PRES., R. L. Stinard, 51 E. 42nd St. (17). SECY., Carl H. Flink, 62 Worth St. (13).
- **NORTH JERSEY:** 1952. Hdqrs., Newark, N. J. Meets, 2nd Tues. PRES., H. M. Patrick, 20 Olcott Ave., Bernardsville. SECY., W. C. Kruse, Jr., 183 N. 13th St. (7).
- **NORTH TEXAS:** 1938. Hdqrs., Dallas, Tex. Meets, 3rd Mon. PRES., J. A. Ray, 4411 Belmont Ave. (4). SECY., G. H. Meffert, 3328 Greenbrier Dr. (5).
- **NORTHEASTERN OKLAHOMA:** 1948. Hdqrs., Tulsa, Okla. Meets, 2nd Tues. PRES., J. T. McKinney, P.O. Box 5145 (16). SECY., G. A. McCune, 1908 Utica Square.
- **NORTHERN OHIO:** 1916. Hdqrs., Cleveland, Ohio. Meets, 2nd Mon. PRES., D. E. Mannen, 9104 Woodland Ave. (3). SECY., H. R. Canoyer, 1900 Superior Ave. (14).
- **NORTHERN PIEDMONT:** 1952. Hdqrs., Greensboro, N. C. Meets, 2nd or 3rd Fri. PRES., S. T. Oliver, 2307 Fairfield Ave. SECY., E. D. Frazier, 320 Ashland Dr.
- **OKLAHOMA:** 1935. Hdqrs., Oklahoma City, Okla. Meets, 2nd Mon. PRES., G. E. Ervin, 2800 N. Oklahoma St. (5). SECY., F. R. Denham, 320 Oklahoma Natural Bldg.
- **ONTARIO:** 1922. Hdqrs., Toronto, Ont., Canada. Meets, 1st Mon. PRES., M. C. Bailey, 1139 Bay St. SECY., H. R. Roth, 57 Bloor St., W.
- **OREGON:** 1939. Hdqrs., Portland, Ore. Meets, Thurs. after 1st Tues. PRES., E. E. Kelly, 4504 S.W. Corbett Ave. (1). SECY., K. N. Flocke, 3027 N.E. 31st Ave. (12).
- **OTTAWA VALLEY:** 1952. Hdqrs., Ottawa, Ont., Canada. Meets, 3rd Tues. PRES., W. J. Robinson, 200½ Bank St. SECY., N. J. Howes, Box 264, R.R. 1.
- **PACIFIC NORTHWEST:** 1928. Hdqrs., Seattle, Wash. Meets, 2nd Tues. PRES., T. C. Caskey, 11642—26th Ave., S. (88). SECY., E. W. Triol, 407 Medical Arts Bldg. (1).
- **PHILADELPHIA:** 1916. Hdqrs., Philadelphia, Pa. Meets, 2nd Thurs. PRES., L. M. Church, 12 S. 12th St. (7). SECY., C. J. Forve, Parkwood Manor, Apt. B-202, State Rd. & Penarth Ave., Upper Darby.
- **PITTSBURGH:** 1919. Hdqrs., Pittsburgh, Pa. Meets, 3rd Mon. PRES., E. C. Hach, 221 Broadmoor Ave. (34). SECY., E. H. Riesmeyer, Jr., 231-33 Water St. (22).
- **ROCKY MOUNTAIN:** 1944. Hdqrs., Denver, Colo. Meets, 1st Wed. PRES., V. F. Vallero, 620 12th St. SECY., Duane Pearsall, 1600 W. 13th Ave.
- **SACRAMENTO VALLEY:** 1952. Hdqrs., Sacramento, Calif. Meets, 1st Wed. PRES., J. E. Marshall, 441 Pico Way. SECY., V. W. Thornburg, 2470 27th Ave.
- **ST. LOUIS:** 1918. Hdqrs., St. Louis, Mo. Meets, 2nd Tues. PRES., G. H. Bemarkt, St. Clair Dr., R.R. 1, Caseyville, Ill. SECY., W. P. Norris, 1118 Fullerton Bldg.
- **SHREVEPORT:** 1948. Hdqrs., Shreveport, La. Meets, 3rd Thurs. PRES., J. S. Malahy, Jr., 1839 Line Ave. SECY., H. E. Scott, 2502 Woodford St.
- **SOUTH CAROLINA:** 1954. Hdqrs., Columbia, S. C. PRES., R. F. Donovan, P.O. Box 3053. SECY., J. E. McMurray, 1639 Blanding St.
- **SOUTH TEXAS:** 1938. Hdqrs., Houston, Tex. Meets, 3rd Fri. PRES., J. W. Holland, 245 Esperson Bldg. (2). SECY., J. C. Lewis, Box 8188.
- **SOUTHERN CALIFORNIA:** 1930. Hdqrs., Los Angeles, Calif. Meets, 1st Tues. PRES., C. D. Walz, 3600 San Pasqual St., Pasadena (10). SECY., H. F. Ulovec, 3886 Olympiad Dr. (43).
- **SOUTHERN PIEDMONT:** 1952. Hdqrs., Charlotte, N.C. PRES., R. S. Fullerton, P.O. Box 3697. SECY., J. R. Clark, P.O. Box 1755.
- **SOUTHWEST TEXAS:** 1946. Hdqrs., San Antonio, Tex. Meets, 3rd Tues. PRES., L. H. Hornor, Jr., 816 Insurance Bldg. SECY., Boone Crisp, P.O. Box 9065 (4).
- **TOLEDO:** 1954. Hdqrs., Toledo, Ohio. PRES., F. C. Richardson, Jr., 1938 Shenandoah Rd. (7) SECY., J. F. Guest, 1815 N. 13th St. (2).
- **UTAH:** 1944. Hdqrs., Salt Lake City, Utah. Meets, 3rd Thurs. PRES., A. A. Maycock, P.O. Box 36 (10). SECY., W. L. Stuewe, 1472 S. State St. (4).
- **VIRGINIA:** 1946. Hdqrs., Norfolk, Va. Meets, 3rd Wed. PRES., H. E. Marquart, 111 W. Main St. SECY., R. L. Burton, Jr., 1913 Lafayette Blvd.
- **WASHINGTON, D. C.:** 1935. Hdqrs., Washington, D. C. Meets, 2nd Wed. PRES., G. C. F. Asker, 1109 W. Broad St., Falls Church, Va. SECY., C. P. Humke, 5905 Berwyn Rd., Rt. 1, Box 89, College Park, Md.
- **WEST TEXAS:** 1953. Hdqrs., Lubbock, Tex. PRES., R. B. Carow, P.O. Box 3206. SECY., H. L. Mayes, P.O. Box 151.
- **WESTERN MICHIGAN:** 1931. Hdqrs., Grand Rapids, Mich. Meets, 2nd Mon. PRES., F. W. Brundage, 512 N. Park St., Kalamazoo (11). SECY., F. L. Murray, 482 W. Michigan Ave., Battle Creek.
- **WESTERN NEW YORK:** 1919. Hdqrs., Buffalo, N. Y. Meets, 2nd Mon. PRES., Q. P. Thompson, 260 Richmond Ave. (22). SECY., G. E. Kuhn, 475 Woodland Dr., Kenmore (23).
- **WISCONSIN:** 1922. Hdqrs., Milwaukee, Wis. Meets, 3rd Mon. PRES., L. C. Plaehn, 914 N. Broadway (2). SECY., H. W. Alyea, 507 E. Michigan St. (2).

SPECIAL BRANCH

- **SWITZERLAND:** 1952. Hdqrs., Zurich. PRES., H. C. Bechtler, Anemonenstrasse 40 (47). SECY., Walter Hausler, Erbstrasse 2, Kusnacht.

STUDENT BRANCHES

- **NORTH CAROLINA STATE COLLEGE:** 1948. Hdqrs., Raleigh, N. C. PRES., Alvah Ehrman, Box 4502, State College Station. SECY., R. W. McDonald, 1010½ Vance St.
- **OKLAHOMA A. & M. COLLEGE:** 1950. Hdqrs., Stillwater, Okla. PRES., C. E. Durrett, 1215 College. SECY., R. M. Jauch, 308½ W. Maple.
- **OREGON STATE COLLEGE:** 1949. Hdqrs., Corvallis, Ore. Meets, 1st Wed. after 1st Tues. PRES., R. E. Bulletset, 252 Kings Rd. SECY., I. P. Parkhurst, 1354 Harrison.
- **PURDUE UNIVERSITY:** 1948. Hdqrs., W. Lafayette, Ind. CHAIRMAN, E. B. Katz, 415 State St. SECY., R. A. Chambers, 248 Littleton.
- **TEXAS A. & M. COLLEGE:** 1946. Hdqrs., College Station, Tex. Meets, 2nd and 4th Tues. PRES., D. F. Carroll, Box 6264. SECY., C. W. Farrar, Jr., Rt. 1, Box 339, Bryan.
- **UNIVERSITY OF DETROIT:** 1949. Hdqrs., Detroit, Mich. Meets, 1st Tues. PRES., J. C. Rumpf, 16511 Muirland (21). SECY., L. J. Hayes, Jr., University of Detroit.
- **UNIVERSITY OF TEXAS:** 1949. Hdqrs., Austin, Tex. Meets, 1st and 3rd Tues.
- **UNIVERSITY OF TORONTO:** 1951. Hdqrs., Toronto, Ont., Canada. PRES., W. A. Stewart, 86 Roxborough St., W. (5). SECY., R. M. Davies, 144 Manor Rd., E.

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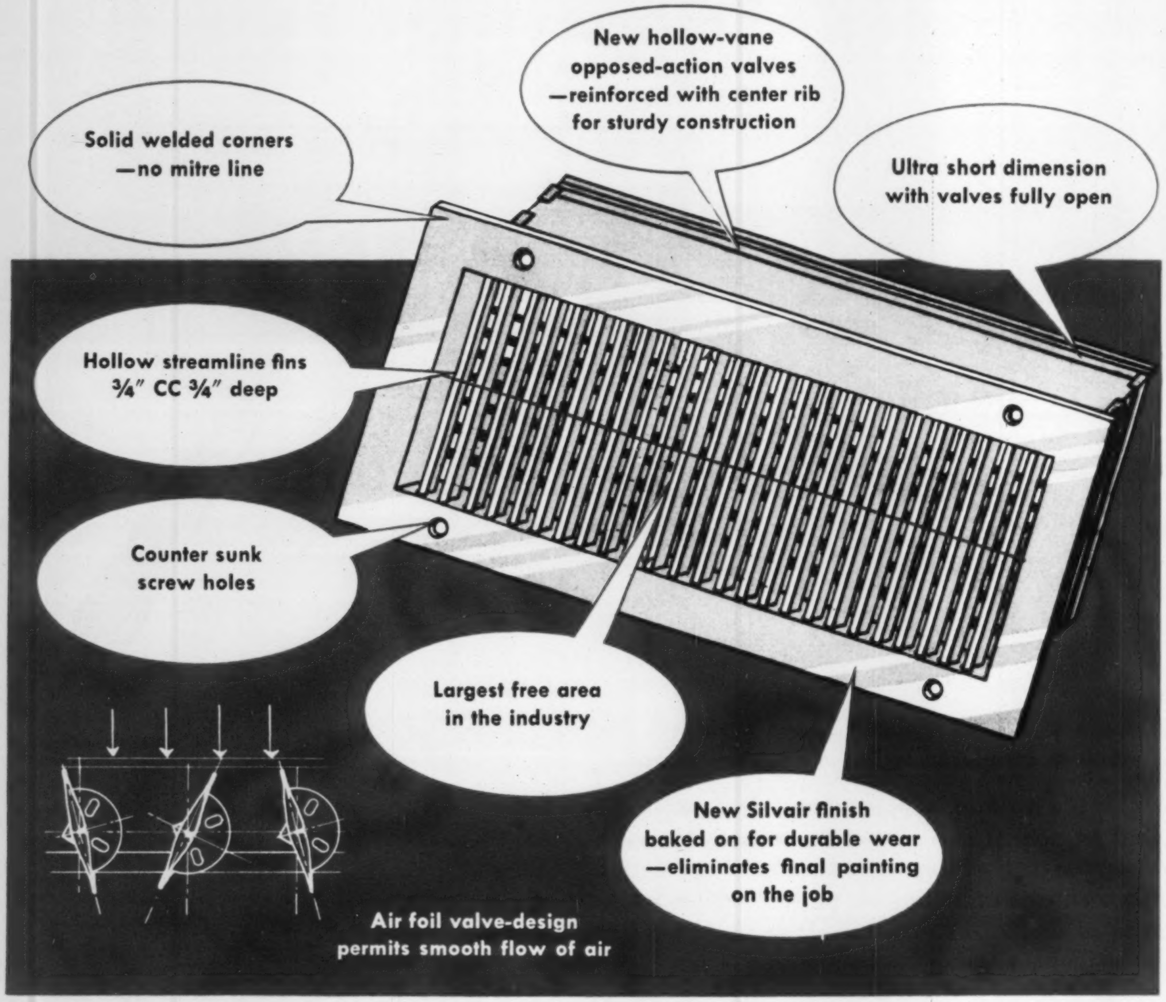
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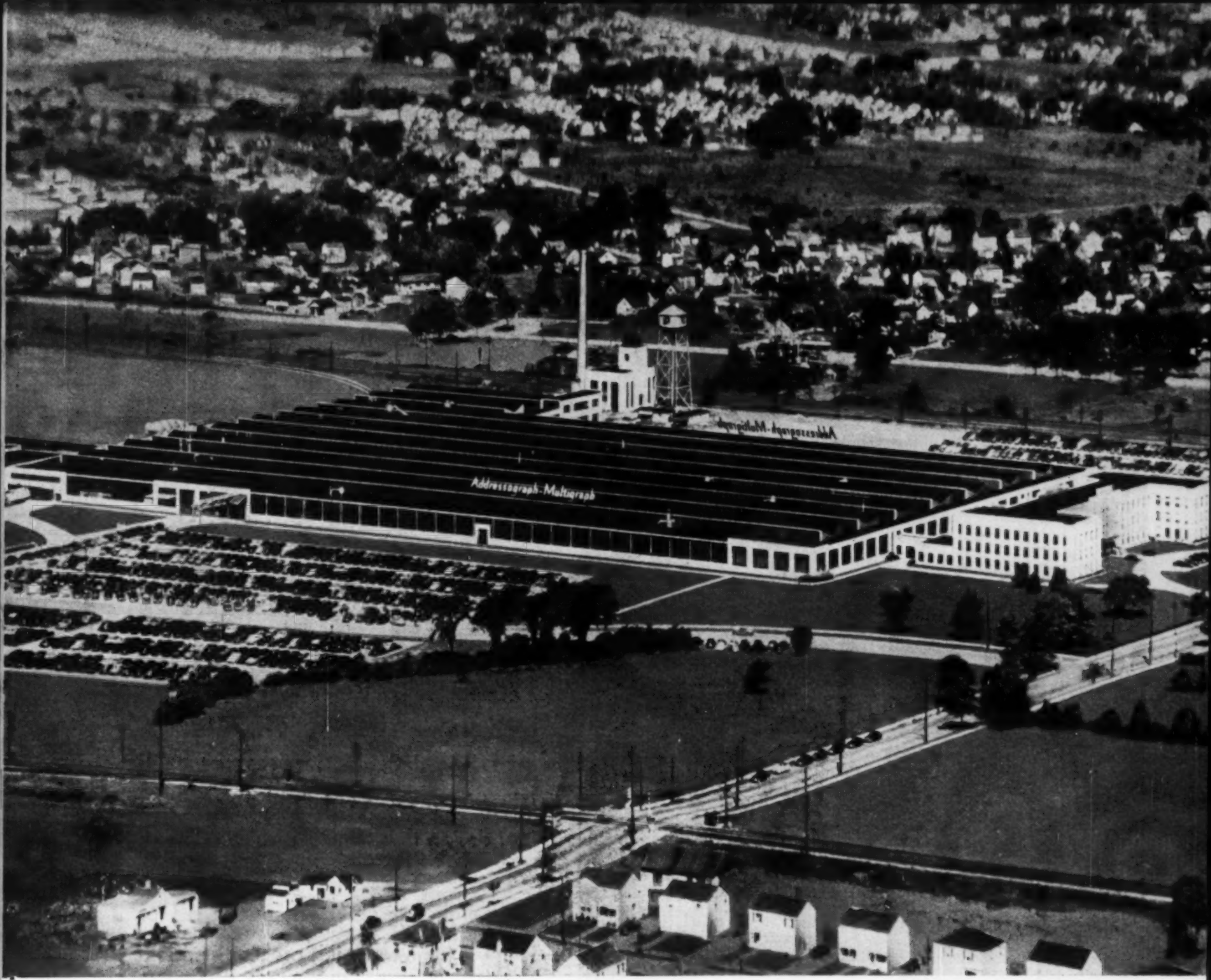

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The Addressograph-Multigraph Corporation has a modern plant in suburban Cleveland. For economy and efficiency, the firm's boiler plant is coal-fired and boasts the latest in coal and ash handling equipment.

Coal offers many advantages to Addressograph-Multigraph. It is easy to handle. Only one man per shift is required to run the boiler plant on a 24-hour basis. There is no air pollution problem. And best of all is the low cost of operation! Coal costs 29.6% less than the next cheapest fuel and 35% less than the third one! With these benefits, no wonder Addressograph-Multigraph is a satisfied user of coal!

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If you're planning to modernize your plant or build a new one—or if you are just interested in cutting fuel costs—find out how coal, burned the modern way, compares to other fuels. Talk to a consulting engineer or your nearest coal distributor. Their advice may save you thousands of dollars every year.

facts you should know about coal

In most industrial areas, bituminous coal is the lowest-cost fuel available.

Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar.

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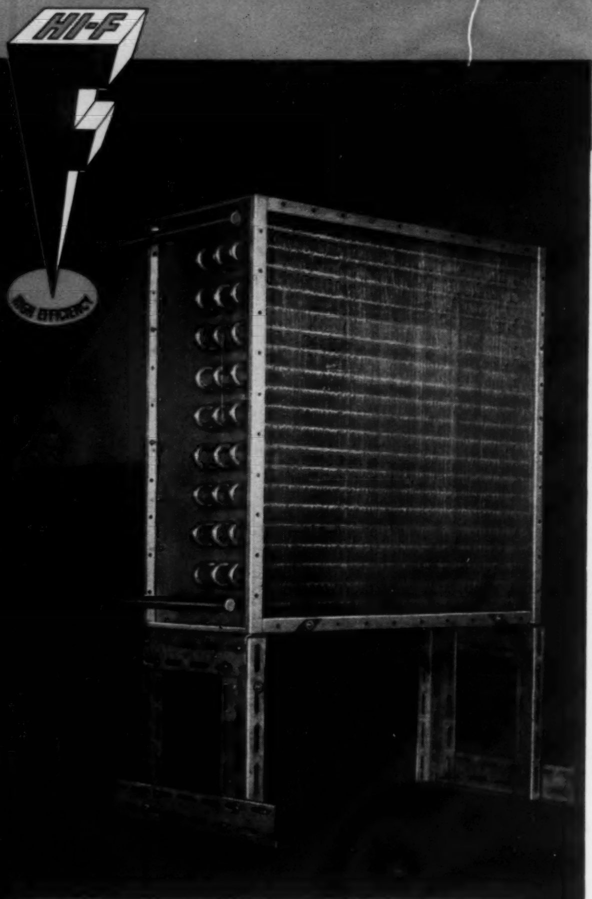

Hi-F Air Cooled Condenser for mounting in stand on roof or remote outside location—also indoor installations with discharge duct to outside. Low Cost. ELIMINATES USE OF WATER. ¾, 1, 1½, 2, 3, 5, 7½ and 10 ton capacities.

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Recently completed is St. Clair Village, a 1,089-unit project on Pittsburgh's upper South Side. The Pittsburgh Housing Authority naturally wanted the best materials used in the construction of this development. So, to insure *top-quality* gas, heating and waste lines, 274 miles of Spang CW Steel Pipe were installed to provide these important basic services throughout the entire project.

This is another example of Spang CW acceptance as being a *top-quality* product. That's because Spang CW Pipe is quality-controlled throughout its entire manufacturing process. Only *top-grade* steel is used . . . close control is maintained during forming . . . the finished pipe is doubly-inspected before shipment.

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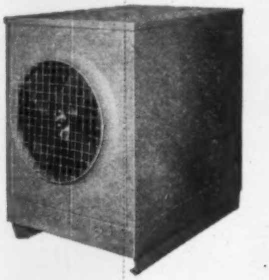
on the wetted deck surface against rotting or fungus attack



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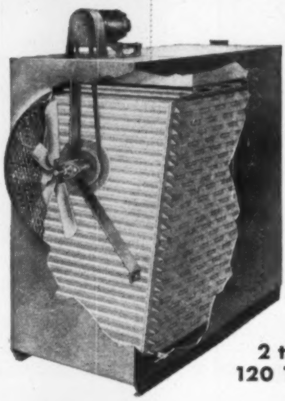
Only Halstead & Mitchell can offer a 20-Year Guarantee on the wetted deck surface against rotting or fungus attack because only Halstead & Mitchell creosotes cooling tower wood. No other material, subject to deteriorating or rusting, can be so guaranteed.

Stainless steel fans, sheet steel cabinets hydraulically painted with vinsynite, vinyl zinc and chlorinated rubber . . . add to this protection for the longest life. There's no extra cost for these extra protections . . . just extra long time benefits on the job.



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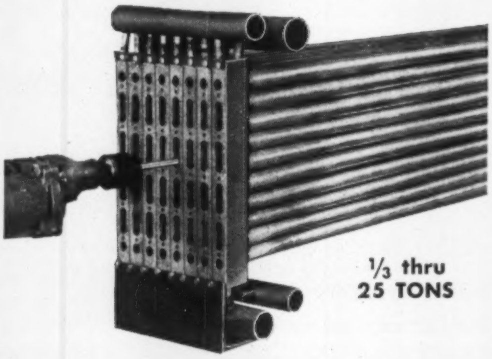

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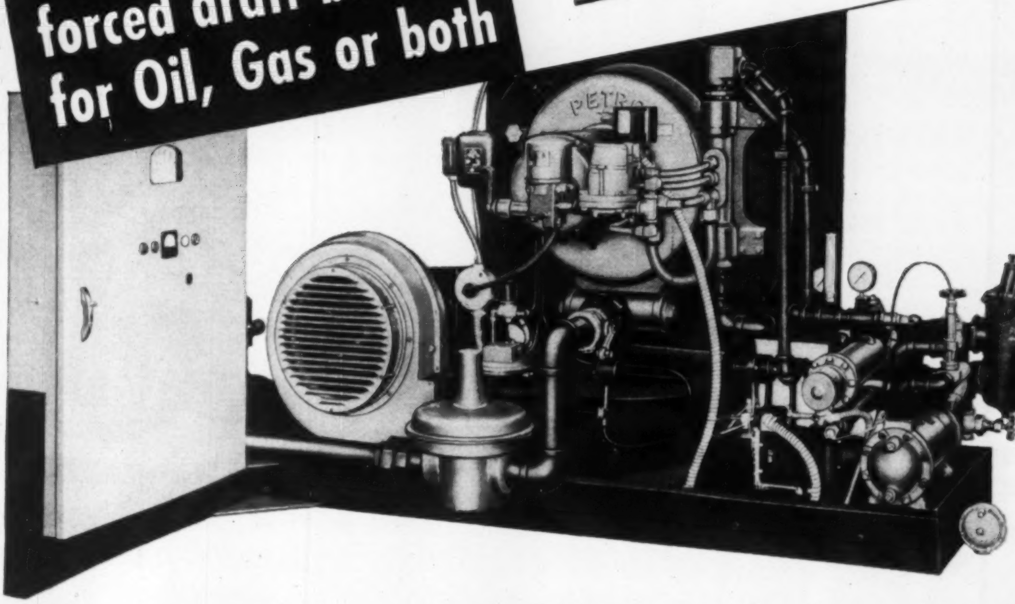

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This Petro package unit is much more than a conversion burner. It is a *complete* combustion system in which all elements are correctly balanced—and integrated—a thoroughly engineered firing plant.

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Neat, safe, and complete—the Petro control panel is totally enclosed with all instruments wired and tested at the factory. Can be attached to frame as shown, turned 90° or 180° or mounted elsewhere in the boiler room.

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OIL—Petro's highly efficient horizontal rotary oil burner is adaptable to the entire range of fuel oil grades. Exclusive Petro Thermal Viscosity System automatically heats the heavier oils before injecting into atomizing cup. Assures quick pickup with sure and economical firing of lower cost fuels.

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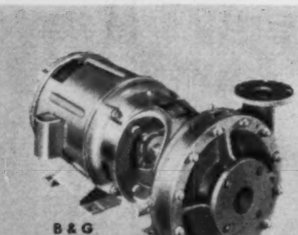
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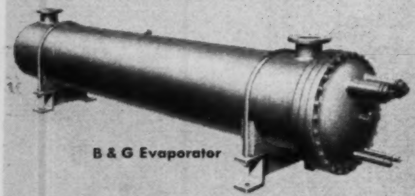
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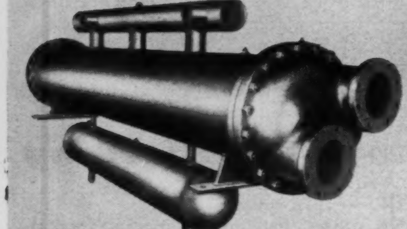
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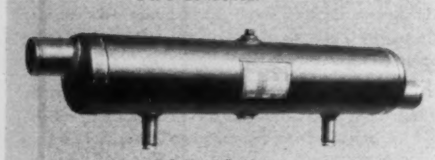
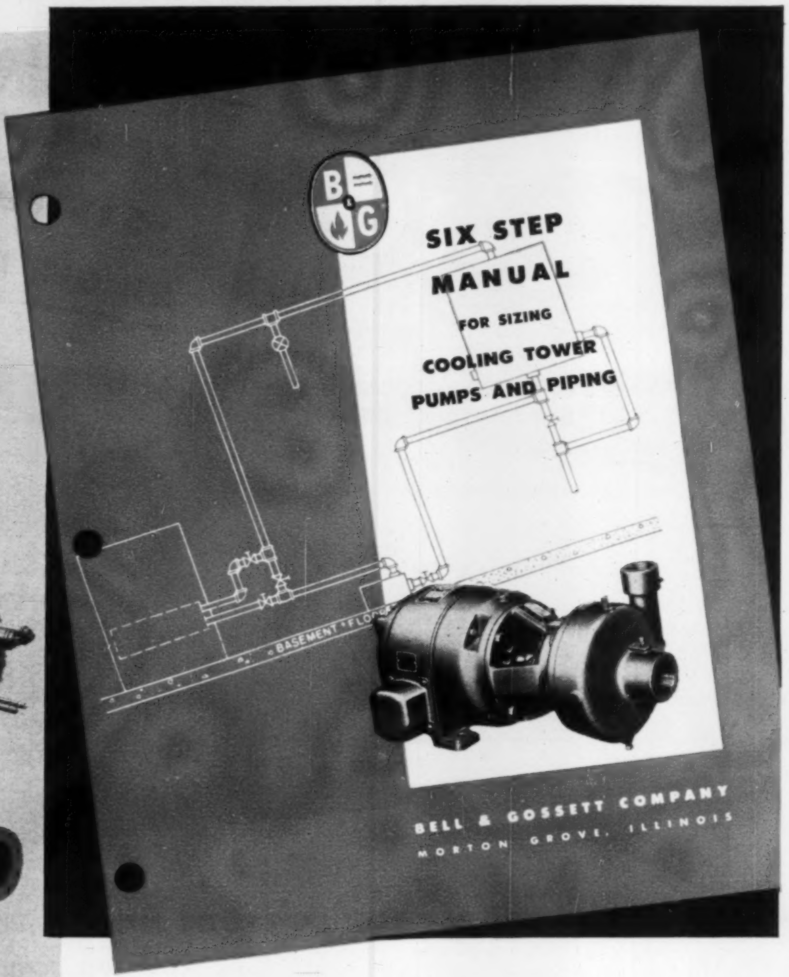

B & G Heat Exchanger


SIX STEP
MANUAL
FOR SIZING
COOLING TOWER
PUMPS AND PIPING

BELL & GOSSETT COMPANY
MORTON GROVE, ILLINOIS

This authoritative Manual fills a long-felt need in the air conditioning and refrigeration industry! It enables you to quickly and accurately size the pump and piping for any cooling tower application.

In six simple steps the procedure is given for determining the flow rate required—the static head and pressure drop through the system—sizing the pump—and for a final check to be sure that the most efficient and economical selections have been made. A method of sizing pipes for gravity flow is also outlined in the Manual.

Easily read tables and charts shorten designing time. A handy work sheet is included which lists all calculations in correct sequence and prevents possible errors.

Every designer of refrigeration and air conditioning systems will find the B & G Manual an invaluable aid.

FREE! **Send to Bell & Gossett Co. for your copy of the B & G Six Step Manual for designing cooling tower systems**

BELL & GOSSETT
COMPANY
Dept. RDU-5, Morton Grove, Ill.
Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto, Canada

TWENTY-FOOT LENGTHS of 10" I.D. copper tubes receive final inspection in one of the mills of The American Brass Company. ANACONDA Seamless Drawn Copper Tubes are made up to 26" I.D.

Anaconda Copper Tubes last longer... can actually lower your plant piping costs

Planning a new installation? Want to replace unsatisfactory piping? Then look into the cost and performance advantages of ANACONDA Copper Tubes *first*. Many plants have found them the *least costly* piping material available.

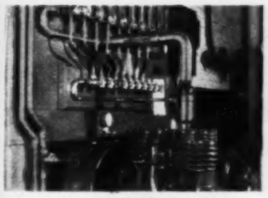
Here's why: ANACONDA Copper Tubes are light. They come in long lengths. Smaller sizes are bent right on the job. All this means big savings on installation costs. And copper tubes can't rust. They resist corrosion and guard against contamination. Smooth interiors mean smoother flow. Pumping costs are often lower.

Here's another advantage. ANACONDA Copper Tubes – connected with solder-type fittings – can be taken down, moved or have new connections cut in faster than with threaded pipe. *You can meet changing plant conditions easily.*

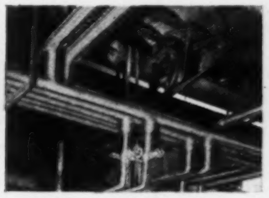
If we can be of assistance in solving a piping problem in your plant please write to: *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Limited, New Toronto, Ont.*

5446

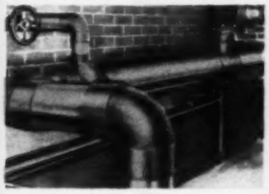
Use Anaconda Copper Tubes for:



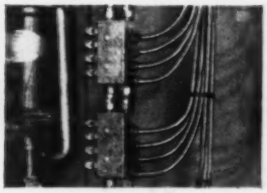
REFRIGERATION AND AIR CONDITIONING



HOT AND COLD WATER SUPPLY LINES



INDUSTRIAL HEATING LINES



AIR, LUBRICATING AND HYDRAULIC LINES

for copper piping call an

ANACONDA

Distributor

$24,000 SAVED!

customer reduces estimate of job cost $24,000 by switch to WELDOLETS

An oil piping contract recently was reduced by $24,000 by changing specifications to WELDOLET welding fittings.

Comparable savings are possible on almost every piping contract. It will pay you to examine this positive means of reducing your piping costs. Write us for details.

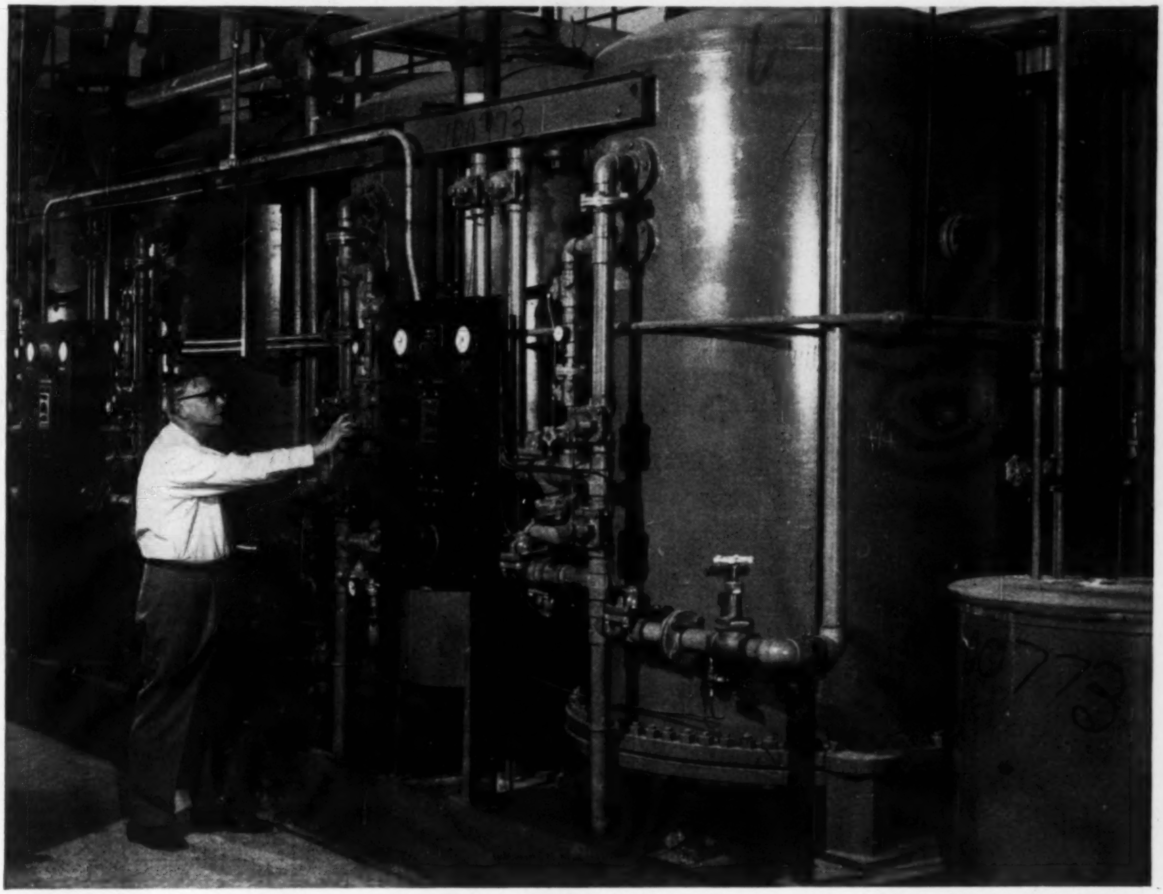
WELDING FITTINGS DIVISION

BONNEY FORGE & TOOL WORKS

715 GREEN ST., ALLENTOWN, PENNA.

Another new development using

B. F. Goodrich Chemical *raw materials*



B. F. Goodrich Chemical Company does not make this pipe. We supply only the Geon resin.

Pipe Dreams come true with Geon Rigid Vinyl!

If you've dreamed of cutting piping costs in half, listen to this: On a major piping installation, General Electric Appliance Park changed earlier planning and used pipe made from Geon rigid vinyl... results show a fine job at much lower cost.

This corrosion resistant Geon pipe carries deionized water at 300 psi in lines ¾" to 2". Fittings are made from Geon, too, by a new injection molding process that provides appreciably greater strength and dimensional accuracy.

Geon rigid vinyl piping costs much less, and in many cases proves more serviceable than high grade steel and alloys. It is light in weight, saves money in installation and change-overs. It resists acids, alkalis, oil and gas . . . has exceptionally high impact strength.

Geon polyvinyl materials make possible many economies and improvements, point the way to increased sales and profits. Geon materials are available in many forms for use in many products—upholstery, flooring, sponge, wire and cable insulation, and a host of others. To find how Geon can fit into your future, please write Dept. BN-1, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

A TRADE MARK OF B. F. GOODRICH CHEMICAL COMPANY

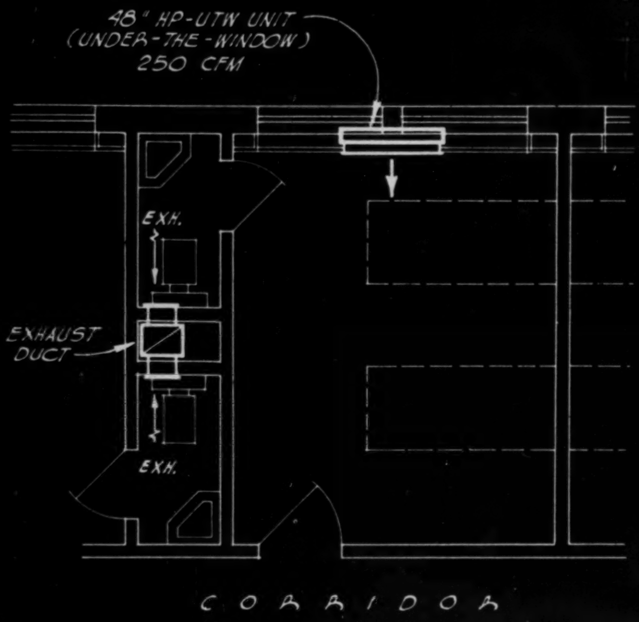
Geon

Polyvinyl Materials

A DIVISION OF THE B. F. GOODRICH COMPANY

GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable.

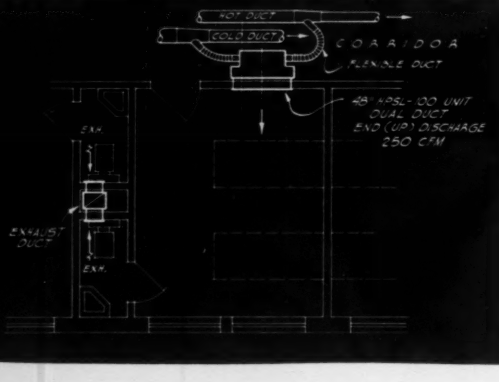
GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

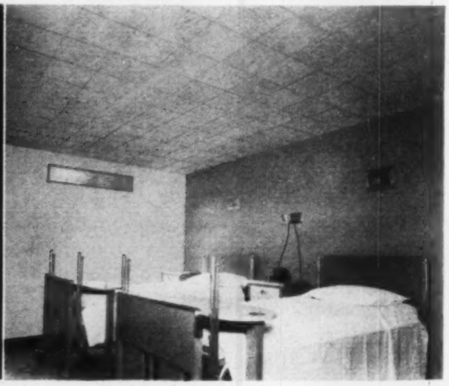

48" HP-UTW UNIT
(UNDER-THE-WINDOW)
250 CFM
EXH.
EXHAUST DUCT
EXH.
CORRIDOR

All-air high velocity units for **hospital air conditioning**

In successful use in many hospitals throughout the country, Anemostat HV round, square and straight line units are adaptable to a wide variety of architectural designs. Diagrams and photographs show typical applications of straight line units.

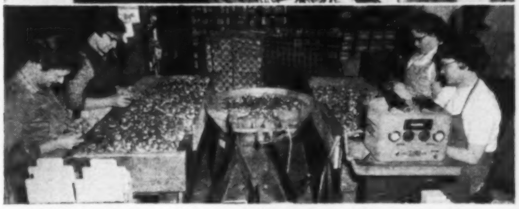
The All-Air High Velocity system of draftless air distribution offers many important advantages for hospital air conditioning. High velocity units, used with smaller than conventional ducts, save space and money. They substantially reduce sheet metal required, can be installed faster, with less labor. Since there are no coils in All-Air HV units, clogging and odors are eliminated. They operate entirely with air processed in the main equipment room; no fans, filters or electric motors are needed with All-Air HV units.


HOT DUCT
COLD DUCT
CORRIDOR
FLEXIBLE DUCT
48" HPSL-100 UNIT
DUAL DUCT
END (UP) DISCHARGE
250 CFM
EXH.
EXHAUST DUCT
EXH.



● ***For latest data on All-Air High Velocity units,***
write on your business letterhead for *new Selection Manual 50* to
Anemostat Corporation of America, 10 E. 39 Street, New York 16, N. Y.

not just spot checked ...EVERY U-BRAND FITTING IS individually inspected !



Installation of just one faulty pipe fitting can backfire into hours of extra work after a job is completed. Too often it can also mean serious and costly damage.

At Union Malleable, from raw material to finished product, every effort is made to produce 100% perfect pipe fittings . . . and that it as it should be.

But we go one step further . . . to insure against defective fittings ever reaching the hands of our customers, **each individual U-BRAND fitting receives a final qualifying inspection by workers trained to detect imperfections.**

Whether you buy, sell or install pipe fittings, you'll find this extra care can help build reputations as well as profits.

The Union Malleable Manufacturing Co.,
Ashland, Ohio

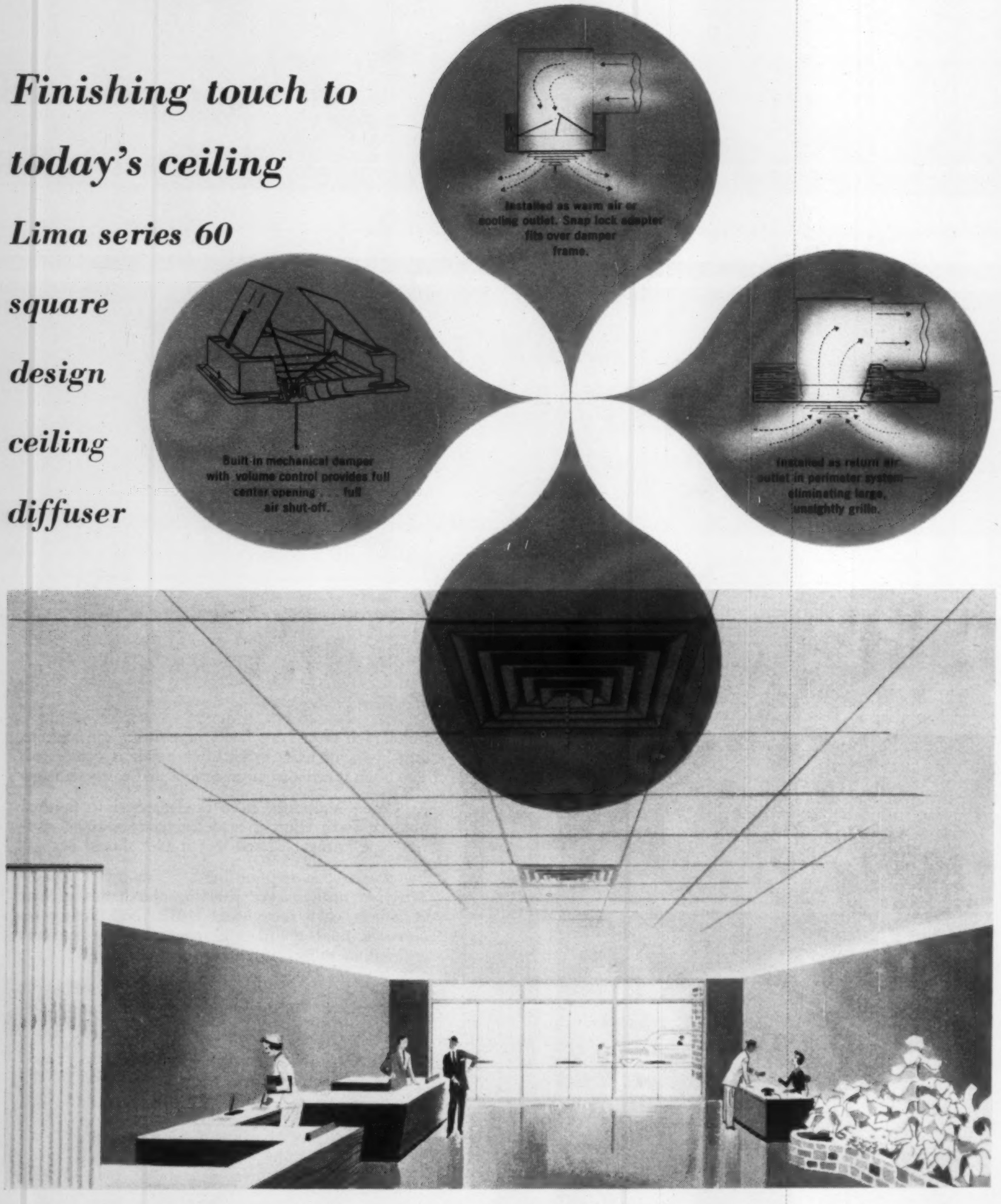
One Source For All Your Fitting Needs
Galvanized and Black U-Cote Malleable Iron Pipe Fittings — Unions — Plugs and Bushings — Cast Brass Solder Joint Pressure and Drainage Fittings — Cast Iron Drainage and Screwed Fittings — Steel Nipples and Couplings.

Sold Through Leading Wholesalers All Over the World

U-BRAND
Quality
PIPE FITTINGS

Finishing touch to today's ceiling

Lima series 60 square design ceiling diffuser



Installed as warm air or cooling outlet. Snap lock adapter fits over damper frame.

Built-in mechanical damper with volume control provides full center opening . . . full air shut-off.

Installed as return air outlet in perimeter system—eliminating large, unsightly grille.

accentuates the beautiful symmetry of modern ceilings

When the specs call for a ceiling diffuser, you'll make your customer happier—and your job easier—by installing the Lima square design ceiling diffuser. It harmonizes beautifully with today's acoustical tile or block ceilings, and modern rectangular rooms. Light beige Lima finish is permanent and requires no repainting.

assures complete comfort in heating and cooling

The Lima-engineered square design and tiers of step-down vanes provide greater free area for more effective air diffusion in all directions at correct angles for complete indoor comfort—in heating and cooling. *Ask your jobber's salesman or write direct for new complete Lima catalog.*

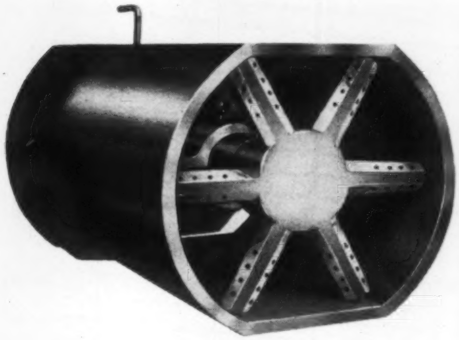
Lima REGISTER COMPANY
LIMA, OHIO

Sold exclusively through heating wholesalers and manufacturers

POWER and HEATING BURNERS

JOHN ZINK

JZ

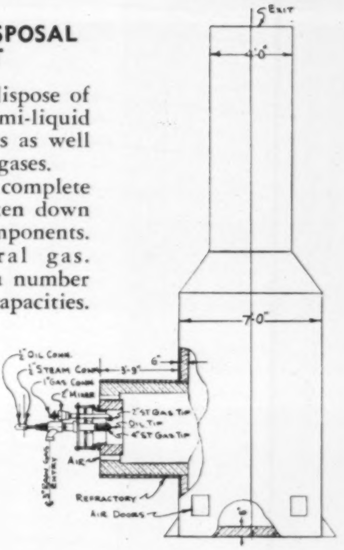


SERIES "S" STAR BURNERS

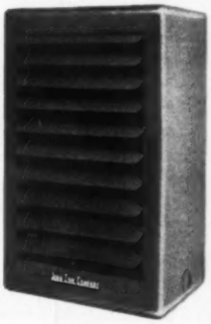
Low pressure, radiating armed spider gas burner. Available for either horizontal or vertical firing. Will accept full modulating control perfectly with short clear flame. Applicable for heating or power boilers. Capacities from 300,000 Btu/hr. to 13,000,000 Btu/hr.

WASTE DISPOSAL UNIT

Designed to dispose of liquid or semi-liquid waste products as well as obnoxious gases. Furnished as complete units, or broken down into their components. Burns natural gas. Available in a number of sizes and capacities.



JZ UNIT HEATERS



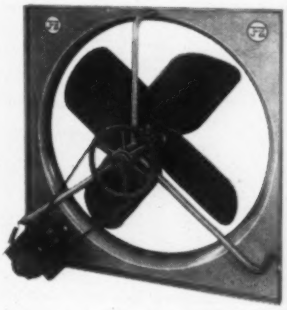
Forced air suspended type. A.G.A. approved for natural, mixed, manufactured or LP gas. Complete packaged unit fully automatic. Ceiling installation saves valuable floor space.

Designed for maximum quiet operation with highest possible air delivery.

Complete packaged unit includes heater with fan, motor, fan guard, safety shut-off, limit control, regulator, firing cock, solenoid valve and thermostat.

Available in three sizes with input ratings of 75,000 Btu/hr., 135,000 Btu/hr. and 190,000 Btu/hr.

VENTILATING FANS



For exhaust or forced air use. Superflo fan is complete unit. Can be installed in horizontal or vertical position.

Fans have welded steel frame, balanced propellers, balanced pulleys and V-Belt drive. Venturi type throat induces maximum movement of air.

Propeller sizes from 24" to 48".

Write for illustrated bulletin on John Zink equipment.

All John Zink Burners are protected by U. S. Letters of Patent

JOHN ZINK COMPANY

4401 South Peoria
Tulsa 5, Oklahoma

• MORE STRENGTH PER SQUARE INCH. 48" x 48" TITUS GYMNASIUM GRILLE supports the combined weight of 4 Titus factory workers.

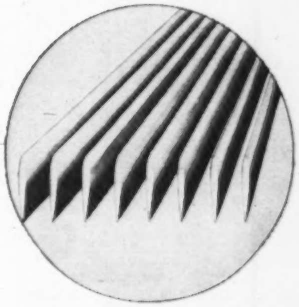
designed by TITUS

Gymnasium Grille

Here's a grille that's been especially customed for school and institutional application. It features *special built-in durability* to withstand gymnasium use and abuse. Made to give long efficient service under the most rugged conditions of bouncing basketballs, baseballs, jarring kicks, and bumps. Has smooth contours, no sharp corners or points. Is safety approved for school use. *Is simply so rugged it stops damage and replacement costs.*

Clean cut, compact, created to blend with the lines of modern school architecture. Available as grille face only (Model G-1) or grille face with attached volume controller (Model G-2).

The Volume Controller features the famous solid section, extruded aluminum, streamlined Airfoil louvers. Noise and turbulence are cut to a minimum. At the same time, perfect, draft-free air distribution is assured.



• MORE AIR CONTROL PER SQUARE INCH. Close up view of *Airfoil* volume control louvers. Each blade is individually adjustable. Concealed louver support eliminates mullions and butted construction.

● 14 GAUGE ROUND EDGED FLAT WIRE STEEL BLADES ● VERTICAL STEEL SUPPORT BARS PLACED ON 6 INCH CENTERS ● 16 GAUGE STEEL EXTRA WIDE BORDER FOR EASY MOUNTING ● STANDARD GRADE PRIMER COAT FINISH.

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Gentlemen: Please send me complete free information on the new design gymnasium grille.

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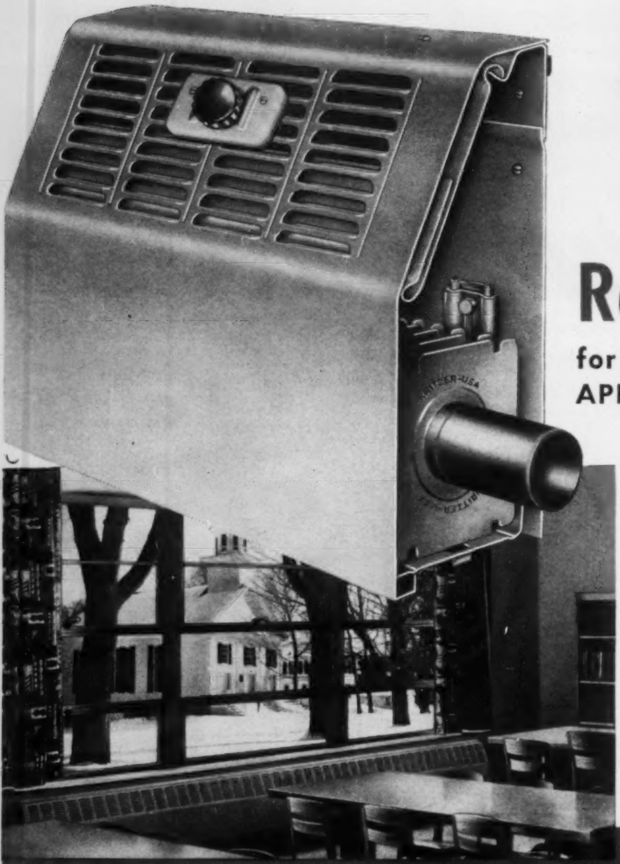
Company ____________________

Address ____________________

City __________ **Zone** ____ **State** __________



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Slope Top

Radiant Baseboard

for INSTITUTIONAL and COMMERCIAL APPLICATIONS is:

RUGGED

Heavy gauge steel covers withstand abuse

ATTRACTIVE

Clean design lines fit any decor

EFFICIENT

High capacity easily handles hard-to-heat places

EASY TO INSTALL

Designed with each installation step in mind

For full information on sizes and ratings write to:
KRITZER RADIANT COILS, INC., 2901 Lawrence Avenue,
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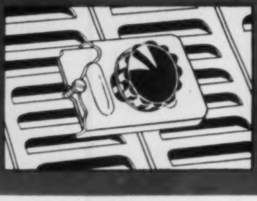
YOU GET THESE EXCLUSIVE KRITZER FEATURES!

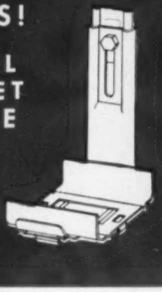
PATENTED DAMPER and CONTROL



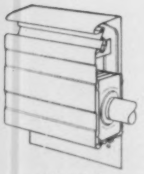
Can be placed at any point along the baseboard. No hinges to bind; no chains to break; no springs to wear out; no holes to drill.

ADJUSTABLE COIL SUPPORT BRACKET and SLIDE CRADLE

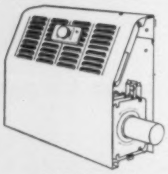
Carries the coil which rides on a self aligning slide cradle. Quiet operation is assured during contraction and expansion of the coil.



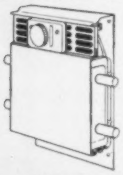
KRITZER QUALITY HEATING PRODUCTS



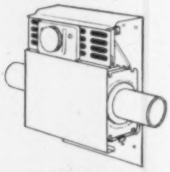
"K" LINE BASEBOARD



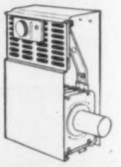
SLOPE TOP BASEBOARD



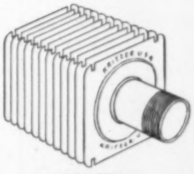
STANDARD BASEBOARD



UNIVERSAL BASEBOARD



CONVECTOR, SLOTTED FRONT



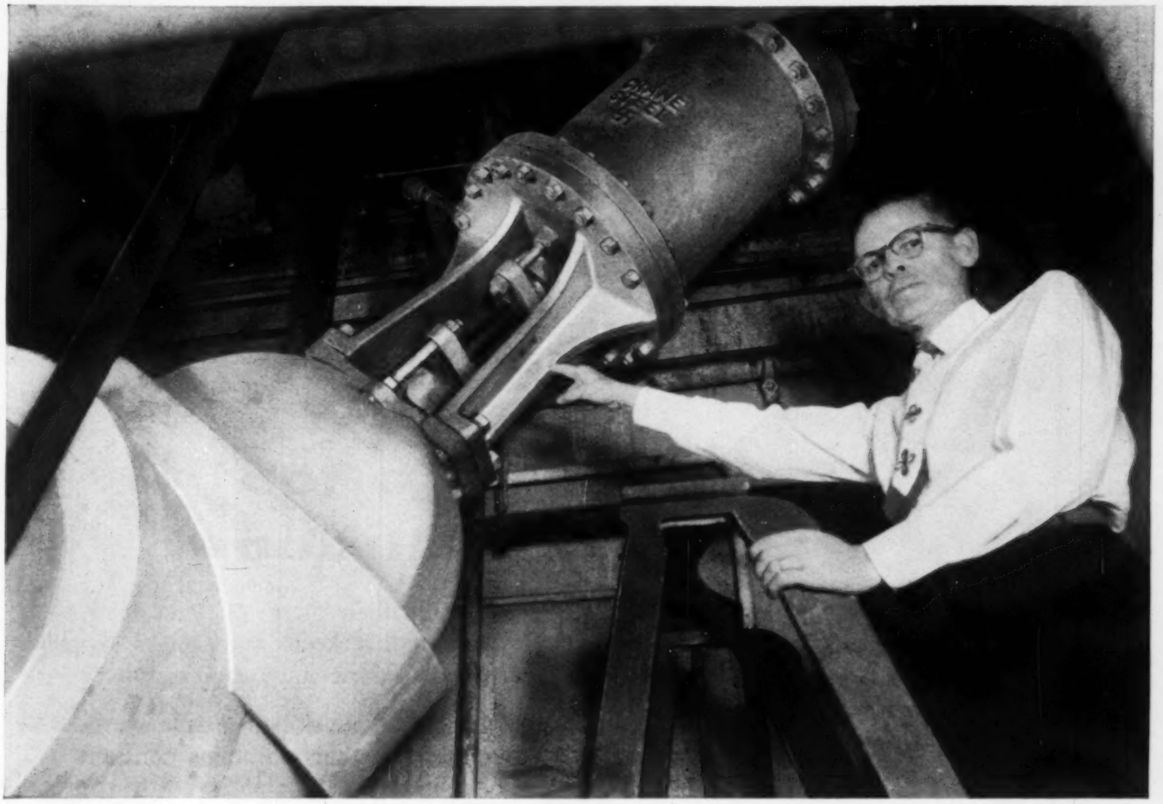
KRITZER FINNED TUBE

REPRESENTATIVES IN PRINCIPAL CITIES

SEE YOUR JOBBER FOR KRITZER PRODUCTS

KRITZER

"IF IT'S KRITZER, IT'S RIGHT, SIR!"



This CRANE VALVE begins new life after 37 years' service!

THE CASE HISTORY—World War One still raged when Cincinnati Gas & Electric Co. installed this Crane steel gate valve in 1917 at its Front & Rose Street Station. Ever since, it has safely controlled the main steam lead to No. 1 turbine—always making tight closure when needed—always responding smoothly to its hydraulic operator. For 37 years it has given such service with no more than routine maintenance—under operating pressure of 250 psi at 600 deg. F.

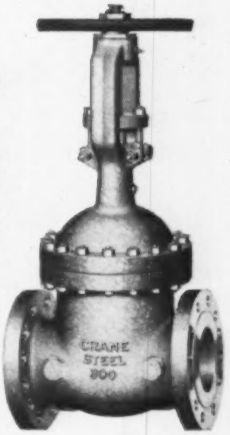
In 1954, the No. 1 turbine was renewed. The Crane steel valve—with complete confidence in Crane durable quality as demonstrated—was given limited preventive maintenance while down, and reinstalled in its original location.

Long life with minimum maintenance is a deeply rooted characteristic of Crane valves. That's what makes them industry's first choice today for low ultimate cost.

CRANE STEEL GATE VALVES

...a complete line

Here is steel casting at its best, by the pioneer in steel valve development. Here is value in durability . . . dependable operation . . . and in low-cost maintenance that sets Crane steel valves apart from the ordinary. They're made for every service—in all pressure classes and sizes. Consult your Crane Catalog or Crane Representative.



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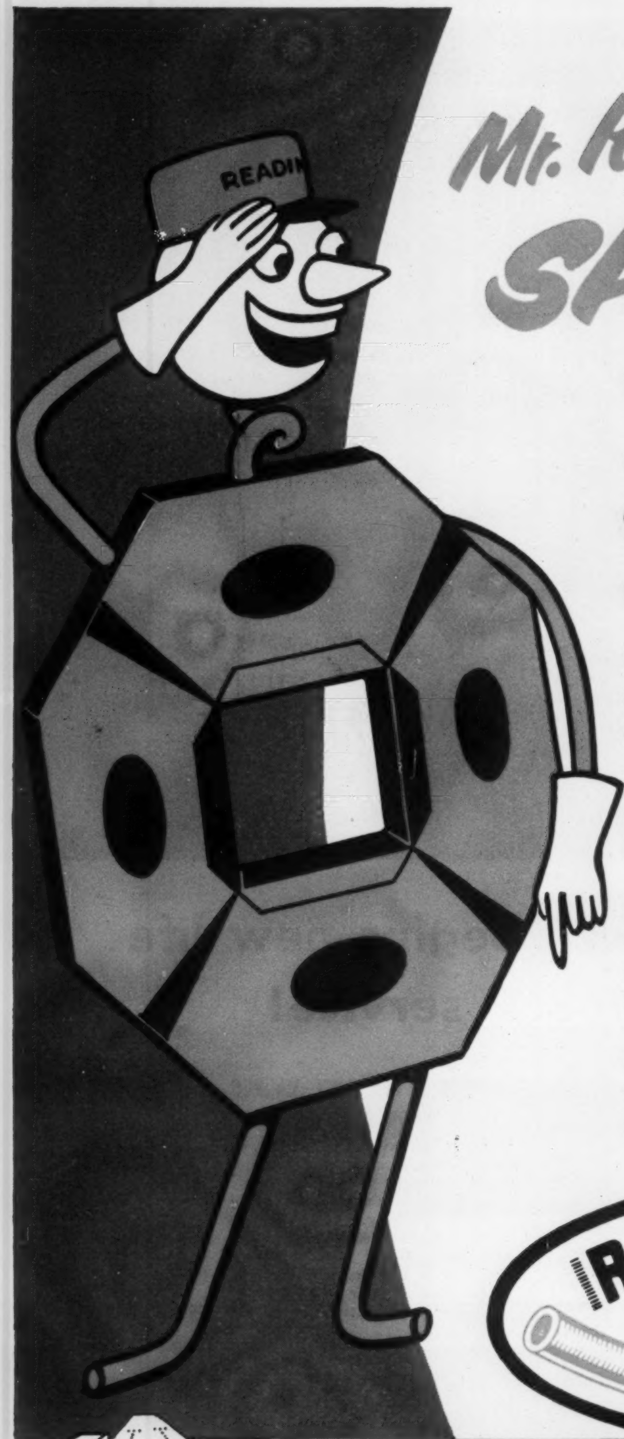
CRANE'S FIRST CENTURY . . . 1855-1955



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We salute their alert "on your toes" operation that keeps contractors supplied and serviced at a moment's notice.

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SPECIFIED FOR FORD...coast to coast

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Ford Central Staff Office Building (Illustrated above)
Architects and Engineers: Skidmore, Owings & Merrill, New York
Mechanical Engineers: Jaros, Baum & Bolles, New York
Contractor: Bryant & Detwiler, Detroit
Mechanical Contractor: Thermotank, Inc., Detroit

LOUISVILLE, KENTUCKY
Ford Assembly Plant Office Building
Albert Kahn Associated Architects and Engineers

MAHWAH, NEW JERSEY
Ford Assembly Plant Office Building
Giffels & Vallet, Inc.
L. Rossetti Associated Engineers and Architects

SAN JOSE, CALIFORNIA
Ford Assembly Plant Office Building
Architects and Engineers: F. A. Fairbrother & Geo. H. Miehls, Detroit
Consultants: Albert Kahn Associated Architects and Engineers, Detroit

Modular Multi-Vent panels will provide a quiet, concealed, draft-free air distribution system in the four new FORD buildings listed at the left.

The Multi-Vent story is simple...this system distributes conditioned air at low velocity by gentle pressure displacement. This unique feature not only eliminates all draft complaints but also allows complete freedom in locating or relocating moveable partitions without repositioning the outlet panels.

Multi-Vent can handle as many as 60 air changes per hour and still maintain even, draftless, low rate of room air motion.

These are only a few of the many reasons why Multi-Vent is the choice of the nation's leading office buildings, hospitals, laboratories, factories, hotels and restaurants.

Write today for new Multi-Vent Literature

multi-vent DIVISION OF

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DUNKIRK Blue Circle

. . . a revealing statement of immediate interest to profit-minded heating men

The building business is in high gear, yet is competitive, quality-wise and price-wise.

Quality-wise people want the healthful comfort, added value and lifelong economy of automatic steam or hot water heat, and you can now give it to them at a price and a profit.

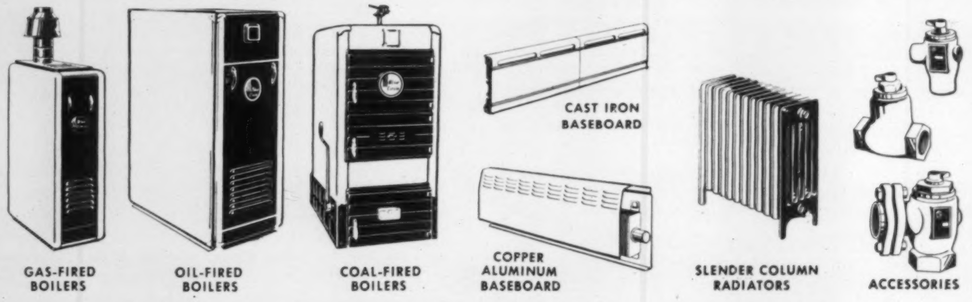
People want compact, space-saving boilers and inconspicuous out-of-the-way baseboard radiation, — and the new Dunkirk line makes it easy for you to give it to them!

People want lifetime dependability, — all Dunkirk Boilers are made of cast iron, the LIFETIME METAL!

Be profit-minded, quality-minded and opportunity minded. The demand is there and you can cash in on it with the complete 1955 Dunkirk Blue Circle line!

There are a lot of interesting reasons why men like you have enjoyed doing business with Dunkirk over a quarter of a century. Write us and we will tell you about them!

Dunkirk Blue Circle — your single source of supply with single responsibility.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OIL-FIRED BOILERS
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Member of the Institute of Boiler and Radiator Manufacturers

ATTENTION PLANT ENGINEERS!

In considering rigid, unplasticized Polyvinyl Chloride pipe, valves, fittings or custom fabrications watch for these 4 important factors:

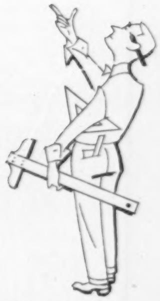
1 **Is the product properly manufactured?**
Boltaron 6200 is produced under rigid standards by the Bolta Division of The General Tire and Rubber Company.

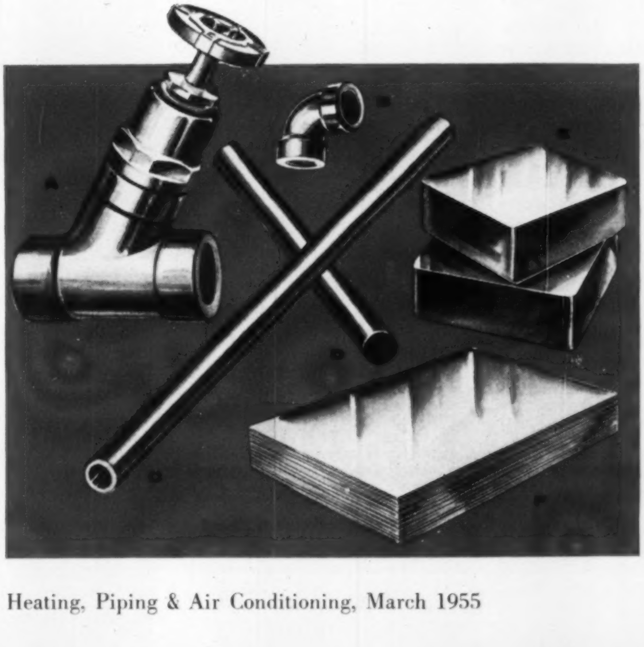
2 **Is it properly fabricated and designed?**
Only well-trained, experienced engineers and fabricators are qualified to fill your individual needs. Every Boltaron fabricator in the United States and Canada is trained and licensed by Hartwell & Son.

3 **Is the application right?**
Unplasticized PVC is NOT a panacea for all industrial ills. It can and will perform with a high degree of satisfaction when properly applied to your specific problems.

4 **Are the company and the product proven in use?**
Hartwell & Son have been exclusive distributors of Boltaron for years. A list of their many successful installations in a wide range of industries can be supplied on request.

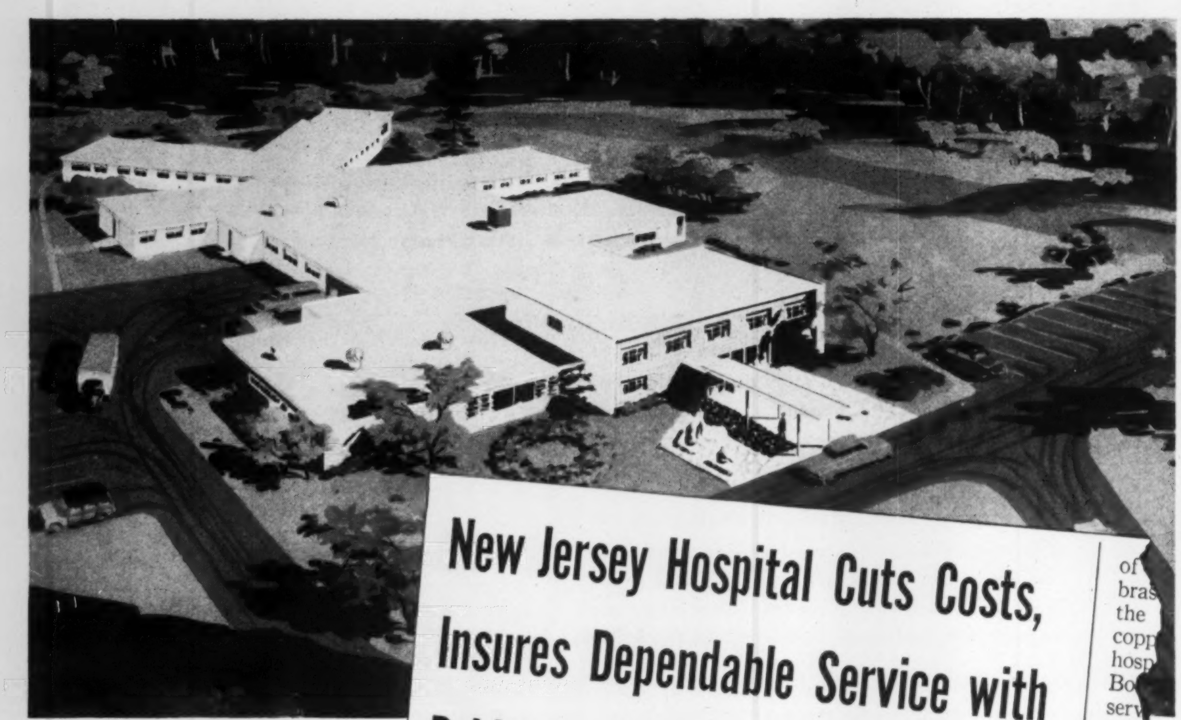
Boltaron
6200





With Boltaron 6200 you can obtain *from one source* a complete line of unplasticized PVC materials. Substantial inventories are kept at all times for prompt shipments. For further information write H. N. Hartwell & Son, Inc., Park Square Building, Boston, Mass., Box 117.

A All-Molded Valves
B Molded Fittings
C Seamless Pipe
D Rod Stock
E Block Stock
F Sheet Stock



New Jersey Hospital Cuts Costs, Insures Dependable Service with Bridgeport Copper Water Tube

BOONTON, N. J.—To save on installation costs, yet get maximum trouble-free service, more than 4 miles (23,700 ft.) of non-rusting Bridgeport Copper Water Tube has just been installed in Boonton's new Riverside Hospital.

Architect:
James B. Bell Assoc., New York, N. Y.
Consulting Engineers:
Slocum & Fuller, New York, N. Y.
General Contractor:
Frank Brisco, Inc., Newark, N. J.
Plumbing & Heating Contractor:
Max Roth, Inc., Newark, N. J.
Bridgeport Wholesaler:
W. A. Birdsall, Irvington, N. J.

Note how easily and smoothly the consistently soft-temper Bridgeport Copper Water Tube is bent around forms for the radiant heating system in Boonton's Riverside Hospital.

The total cost of this system was well below that of a comparable system of rigid, rustable pipe. Installation of the soft-temper Bridgeport Copper Water Tube for radiant heating panels was fast and economical. The use of long 120-ft. coils resulted in fewer connections and simplified the job. Time and labor were also saved by the use of straight lengths of Bridgeport Copper Water Tube and solder-type fittings for the water lines and main heat lines.

The Riverside Hospital is just one of many buildings all over the country getting these advantages from Bridgeport's Copper Water Tube:

1. Savings on overall costs.
2. Freedom from rust and scale.
3. Years and years of dependable full-flow, full-pressure service.

You, too, can benefit by specifying and installing high-quality Bridgeport Copper Water Tube. It is available in all standard types and sizes at quality wholesalers everywhere.

Producers of Bridgeport Plumbing Brass Goods

BRIDGEPORT BRASS
COMPANY ♦ BRIDGEPORT, CONNECTICUT
Sales Offices in Principal Cities—Conveniently Located Warehouses
Mills at Bridgeport, Conn., Indianapolis, Ind., and Adrian, Mich.
In Canada: Noranda Copper and Brass Limited, Montreal

NEW from Black & Decker

A compact, lightweight 3/8" Utility Drill . . . only $38.95

Here's a brand-new drill from Black & Decker . . . designed specifically for your work . . . whether it be heating, plumbing, air conditioning or general sheetmetal contracting.

Ideal for all types of installation, duct, repair or maintenance work—on the job or in the shop. Priced far lower than you'd expect for a tool that's powered and geared to the correct torque and speed with all types of bits for drilling in sheetmetal, cement block and wood. Compactly designed for close work.

Drives up to ¾" wood bits, ⅜" twist drills, ½" masonry bits, 1¼" Hole Saws and the B&D Screw Driving Attachment!

Find out for yourself how powerful, compact & lightweight this new ⅜" Utility Drill really is. Get a free demonstration at your nearby B&D outlet. For more information, write: THE BLACK & DECKER MFG. Co., Dept. 2803, Pennsylvania Ave., Towson 4, Maryland.

For nearest outlet, look under "Tools-Electric"

Black & Decker
⅜ UTILITY DRILL KIT

Available in a complete kit . . . only $64.95

Includes the ⅜" Utility Drill, plus bits and Hole Saws to cut holes in all types of materials: 3 Hole Saws, 3 masonry bits, 3 wood bits and 8 twist drills. Steel box has ample space for carrying additional items.

LEADING OUTLETS EVERYWHERE SELL

Black & Decker®

PORTABLE ELECTRIC TOOLS

How to Select an Economical Temperature Regulator

First of all, what does *economy* mean where temperature regulators are concerned? In some industries it means improvement of product or reduction of spoilage through closer control of process temperatures. In others, it means the paring down of operating expense. The price of the regulator itself is a relatively small factor.

Today's buyers are shopping for:

1. Accuracy of control — not only when the regulator is new, but throughout its service life
2. Dependability — to prevent loss of production time
3. Minimum installation and maintenance cost

Here are a few tips on what to look for when you're installing a new or replacing an old temperature regulator —

Packless construction . . . and for this reason: A diaphragm operated, packless regulator minimizes friction. There are no closely fitted parts to stick or bind because of uneven expansion or collection of foreign matter. Also, there's less maintenance, since no repacking is ever required.

A guarantee against wire drawing of the seats and discs. Insist on it. This guarantee in combination with single seat design assures you of tight shutoff; you avoid expensive steam losses as well as loss of product in a process application.

Broad control range. In a standard regulator you should expect a control range of 100 F. And make sure the unit you select has a vapor tension thermostat that can take over-temperatures of at least 100 F.

Easy maintenance. Why ask for grief? Your temperature regulator should be basically simple in design so that it can be serviced by average plant personnel. All parts should be readily accessible for testing and cleaning.

Double duty. There's no point in buying a separate pressure regulator when you can select a temperature regulator that combines both temperature and pressure control within the same unit.

Self-operating. Make sure you get a regulator that operates on its own initial pressure. By doing so, you avoid the purchasing and maintenance of an air compressor plus air piping, and you're sure of uninterrupted operation during electric power failures.

• • • •

All of these points are important to you when it comes to selecting an economical temperature regulator. Perhaps you didn't realize you *could* expect so much. And perhaps you didn't realize that *Spence* Temperature Regulators offer all these features and more. May we send you our Bulletin T500 containing further details? SE 138

SPENCE ENGINEERING COMPANY, INC.
Walden, New York

Mitchell expands line of Air Conditioners... Offers Air and Water Cooled Self-Contained units from 2 to 7½ tons

CHICAGO, ILL. – Today, 19 new Self-Contained package Air Conditioners were announced by B. A. Mitchell, president, Mitchell Mfg. Co.

Heralded as a milestone in modern air conditioning engineering, the new Mitchell line includes Store Coolers in 2, 3, 5, and 7½ ton capacities both air and water cooled. Residential Add-On units in 2, 3, and 5 ton capacities, air and water cooled. Year 'Round Residential Air Conditioners in 1½, 2, and 3 ton capacities air and water cooled with gas fired furnaces from 75,000 to 150,000 btu.

B. A. Mitchell pointed out that the new Mitchell Air Conditioning line was designed to meet the needs of the contractor, the service man and consumer, with such outstanding advantages as a *Performance Guaranteed* hermetic cooling system, new Slide-A-Way chassis and the amazing Electromagic Filter Eye.

"You expect more from Mitchell and you get all these amazing original air conditioning advantages. Mitchell discarded old fashioned air conditioning ideas and designs to give you more to sell."

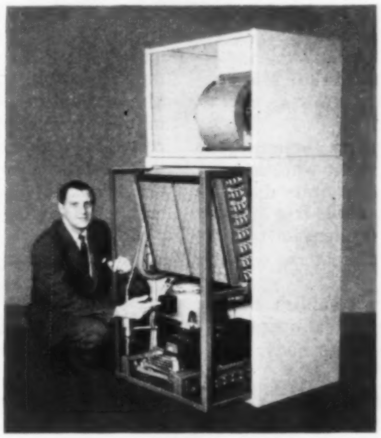
"From the very introduction of room air conditioning, we have played a leading part in developing significant advances in this industry. Mitchell self-contained package air conditioners are being built with the best economies of modern mass production, giving the American public maximum quality and value in air conditioning," said Mitchell.

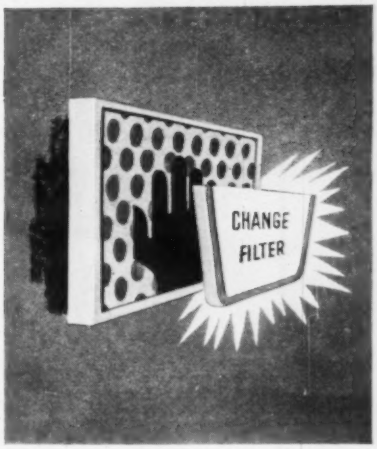
New Slide-a-Way Hermetic Cooling System

R. H. Lodge, Mitchell Sales Manager, demonstrates Slide-A-Way Chassis in 3 H.P. Residential Air Conditioner.

"This Slide-A-Way Chassis means that it will cost less to install and service a Mitchell," said Lodge at the premier showing of this new Residential line. He pointed out that it was not necessary to remove electric controls, damper linkage, baffles or sheet metal parts to slide out the chassis for service or inspection.

Performance guaranteed to provide comfort cooling in the space to be air conditioned, Mitchell self-contained units are hermetic systems, high in capacity and very quiet. Incorporating the latest welded hermetic design, the Mitchell refrigerant system is sealed like a radio vacuum tube with nothing to adjust or oil. There is no need for seasonal pumpdowns, no belts to wear out or adjust, and Mitchell is always ready to operate. The heavy duty Mitchell compressor is super quiet and provides dependable service. There are no manhole openings or gaskets to cause leaks.





Mitchell has exclusive selling advantages

CHICAGO, ILLINOIS–An exclusive filter gauge, called the Electromagic Filter Eye, was announced today as standard equipment on all store units. This revolutionary air conditioning advance operates a positive signal light which tells the user when it is time to change filters.

As a deposit of dirt builds up in ordinary air conditioners, filters become clogged, capacity drops off, power and water costs increase–while cooling power decreases.

Recognizing this problem, Mitchell engineers developed the Electromagic Filter Eye that constantly measures an air conditioner's filtering efficiency and signals the user automatically when it is time to change filters for most efficient, most economical operation.

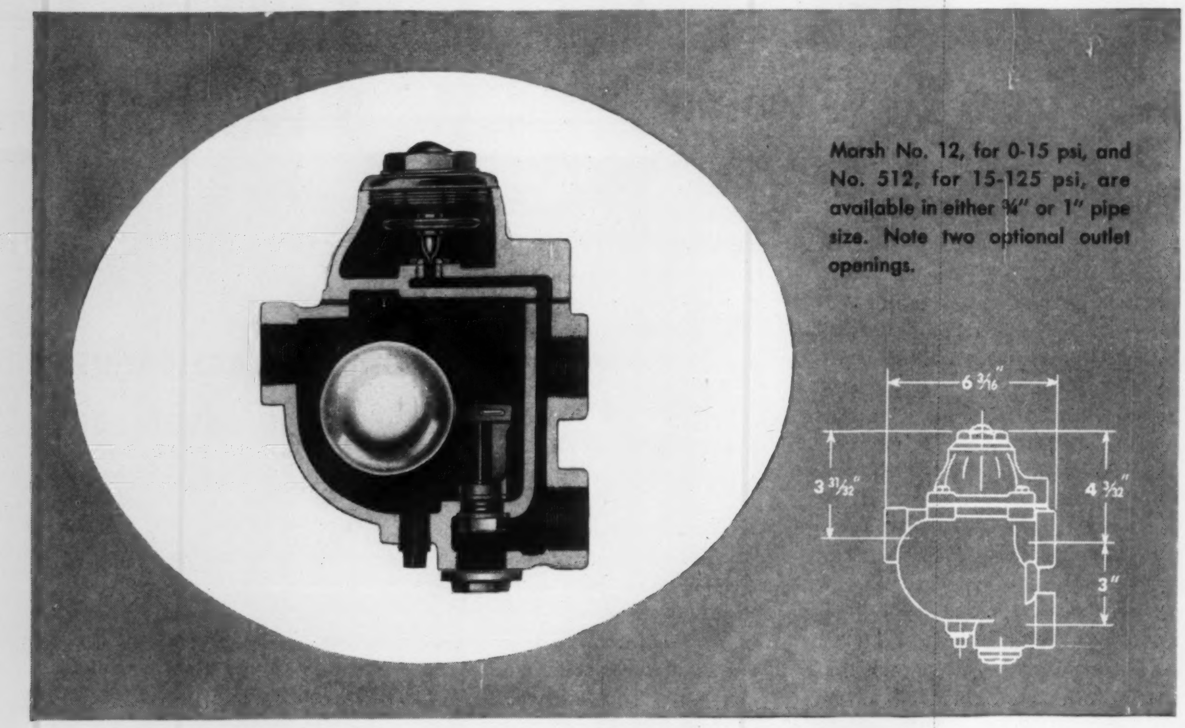
Mitchell merchandising program ready

A complete and detailed sales program is yours to build qualified prospects and close sales. Write today on your business letterhead for complete details on the Mitchell Packaged Air Conditioning Franchise.

MITCHELL MANUFACTURING CO.
Dept. H-1 , 2525 N. Clybourn Ave., Chicago, Ill.

MARSH No. 12

Float and Thermostatic Trap



Marsh No. 12, for 0-15 psi, and No. 512, for 15-125 psi, are available in either ¾" or 1" pipe size. Note two optional outlet openings.

. . . The most dependable trap you can use

There are many jobs that only a float *and* thermostatic trap can handle properly . . . and in the Marsh No. 12 you have the most respected F & T trap ever developed.

Here is a trap that counts its users in thousands. Repeat orders are the rule because men who know have discovered that no other trap can quite duplicate its absolutely dependable, trouble-free performance in removing all air and condensate from steam mains, branches, risers, unit heaters, coils, and similar applications.

Two precision-built assemblies accomplish this. All condensation is discharged by the float-operated valve located at the low point in the trap body. All air is vented through the by-pass by the action of the thermostatic diaphragm, but this is one of those Marsh diaphragms that closes the valve immediately in the presence of steam. In fact the accuracy of response is the attribute that distinguishes the Marsh thermostatic element. It gets the air out and keeps the steam *in!* Another big feature is the straight through design which eliminates troublesome excess piping.

No. 12 is your F & T trap for those low pressure applications — up to 15 psi W.S.P. but its identical-in-operation companion, No. 512, covers the working pressure range of 15 to 125 psi. There is a Marsh trap for every low or medium pressure application.

Write for catalog 76-H covering Marsh heating specialties

MARSH HEATING EQUIPMENT CO., *Sales Affiliate of Jas. P. Marsh Corporation*
Dept. T, Skokie, Illinois
Manufacturers of gauges, thermostatic regulating valves, Solenoid valves, heating specialties

MARSH *Heating Specialties*

SINCE 1865

It's all new... and yours for the asking!

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MODEL—SD

COIL-TYPE SPRAY DEHUMIDIFIER

Washing, Cleaning, Humidifying, Dehumidifying, Heating and Cooling
Air Volumes from 600 to 76,000 cfm.

AIR CONDITIONING FOR ALL SEASONS

- SIMPLIFIED SELECTION from 327 sizes
- FACE AREAS from 1 to 138 sq. ft.
- COIL ARRANGEMENTS from 1 to 3 high, also 1 and 2 wide
- CASING DIMENSIONS from 2 to 17 ft. wide and 1 to 10 ft. high
- CUSTOM UNITS to specifications

MARLO : HEAT TRANSFER
6135 Manchester Avenue St. Louis 10, Missouri

8 Pages Filled with Vital Information

▶ Including:

photos, sizes and dimensions, capacities, engineering and construction data

MARLO COIL COMPANY
6135 MANCHESTER ROAD
ST. LOUIS 10, MISSOURI

Gentlemen: Please send copy of your new Spray Dehumidifier Bulletin to:

NAME ____________________

COMPANY ____________________

ADDRESS ____________________

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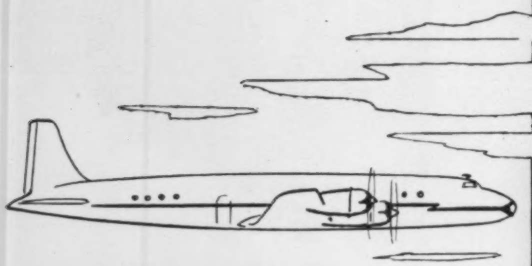
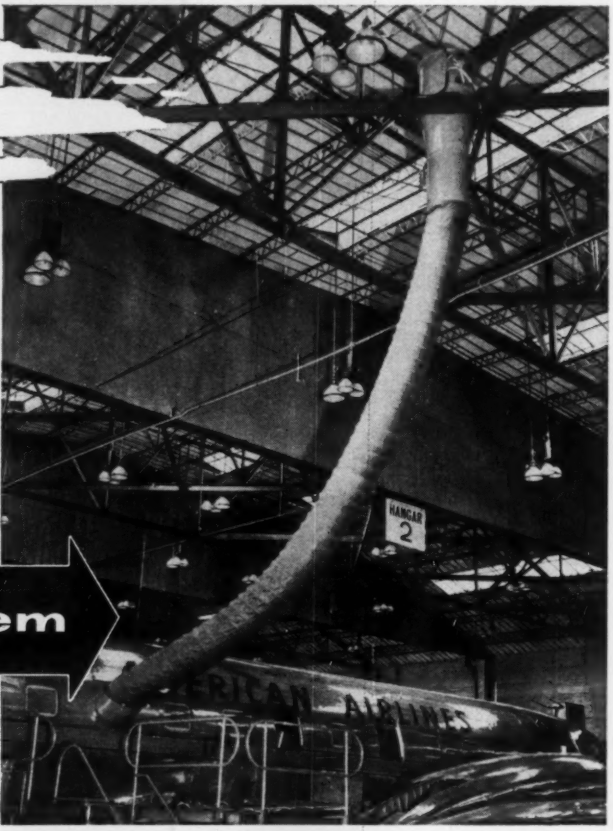
Send for your FREE copy today!

Marlo COIL CO.
Manufacturers of COOLING TOWERS • EVAPORATIVE CONDENSERS • INDUSTRIAL COOLERS AIR CONDITIONING UNITS • MULTI-ZONE UNITS • BLAST HEATING & COOLING COILS
Saint Louis 10, Missouri



AMERICAN AIRLINES



ventilating problem

solved with

JOY AXIVANE FANS

The Tulsa Overhaul and Supply Depot is a nerve center for refurbishing the American Airline Flagship Fleet. Here, hot climate and concentration of technicians working inside the airplanes necessitate serious attention to good ventilation.

Anxious to provide maximum comfort and safety and to conserve floor and storage space, American revised their system. Investigation led to the selection of a Joy AXIVANE fan, equipped with an explosion-proof motor.

The compact vaneaxial design of the AXIVANE fan permitted a permanent, "out-of-the-way" installation in the hangar ceiling trusses. The fan exhausts through 27 feet of 'Spiratube' attachable to an airplane emergency exit. In addition to pulling stale air, fumes, and dust out of the cabin, the fan circulates fresh air through the hangar.

American has added six more AXIVANE fans and has equipped both the Convair and DC-7 hangars with this Joy cabin-ventilator system to replace larger, troublesome, less efficient portable blowers.

There is a Joy AXIVANE fan for any aviation, electronic or industrial application. For details, write for Bulletin J-611, TODAY, to ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

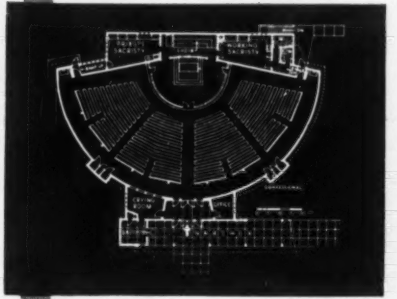
about PORTABLE AND STATIONARY COMPRESSORS, FANS, and OXYGEN GENERATORS

JOY

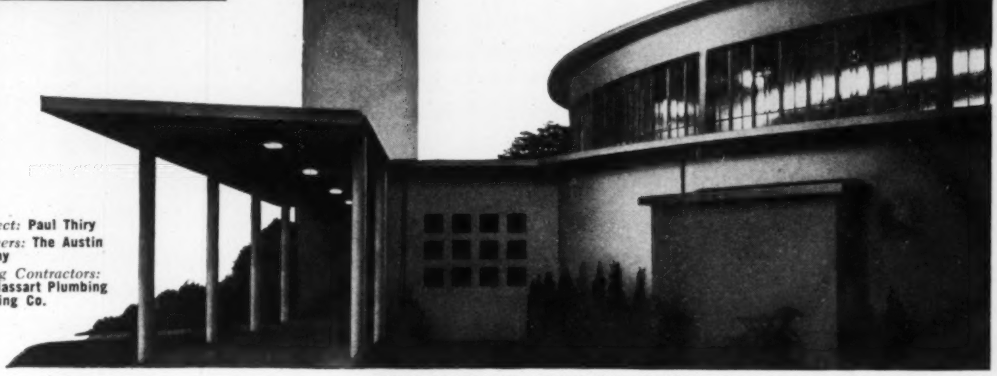
SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885

W&D A5501

PAUL THIRY'S *daring, functional design called for modern*



SARCOTHERM
HEATING CONTROLS



Architect: **Paul Thiry**
Engineers: **The Austin Company**
Heating Contractors: **L. G. Massart Plumbing & Heating Co.**

CHURCH OF CHRIST THE KING, SEATTLE, WASH. Semi-circular arrangement seats 550 persons with no pew more than 50 feet from altar. Other features: 60-foot carillon tower; covered portico, stained glass clerestory.

ARCHITECT PAUL THIRY'S inspiring design for Church of Christ The King is completely functional from its 60-foot carillon tower down to its weather modulated controls.

Radiant heating and the large attendance expected necessitated an extremely accurate, sensitive control system. To do the job, design engineers specified a Sarcotherm Weather Compensated Control System which insures comfort conditions inside regardless of outside temperatures.

Sarcotherm advantages of simple, low-cost, accurate control plus unique engineering service can help you design and install the most efficient system possible. A Sarcotherm engineer will be happy to advise you on your next project.

For full information on Sarcotherm controls, write for complete catalog.

TAKE ADVANTAGE OF SARCOTHERM'S UNUSUAL ENGINEERING SERVICE

In A Class By Itself—Sarcotherm's engineering service begins with the inception of the job, *carries through* every step of the way.

Complete Installation Drawings And Wiring Diagrams—not just general drawings but complete, tailor-made drawings and diagrams for each individual job.

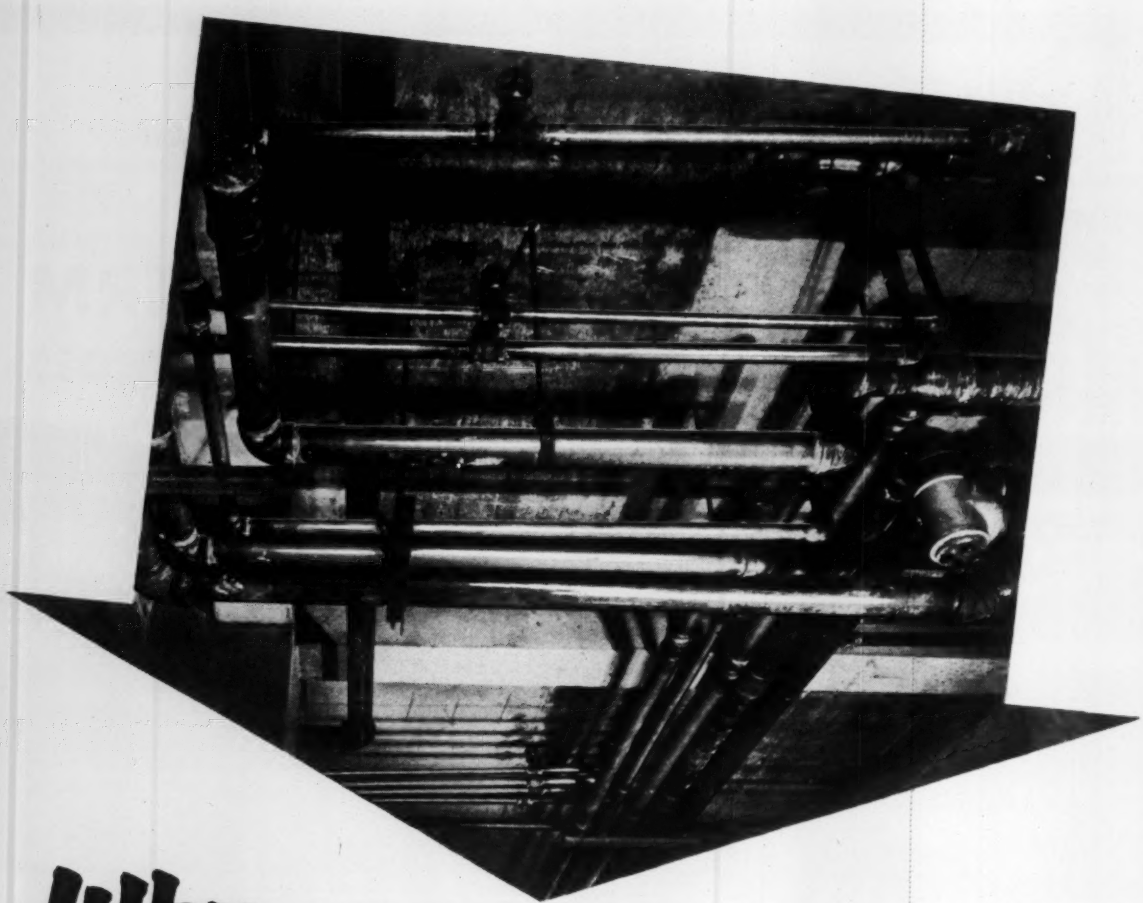
On The Job Help—your contractor gets full cooperation and technical assistance backed by many years of specialized experience.

SARCOTHERM CONTROLS, Inc.

Empire State Bldg., New York 1, N. Y.

An Affiliate of SARCO COMPANY, INC.

Weather Modulated Controls for **HOT WATER, RADIANT AND STEAM** *Heating Systems*



Why will this piping never leak ...never need attention?

The answer to this question is found in the method used to install the piping—the modern threadless method of assembly with threadless fittings silver brazed with SIL-FOS or with EASY-FLO.

Not only does this method assure a permanently leak-proof, maintenance-free system, but it also makes assembly easier and faster. with proportionate savings in costs.

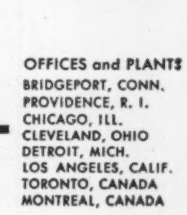
And another great advantage of the threadless method is the really tremendous savings in weight and metal it makes possible by permitting the use of thinner walled pipe and tubing.

GET THE FULL FACTS IN THESE BULLETINS

BULLETIN 20— tells you why the SIL-FOS and EASY-FLO alloys assure permanently leak-tight, care-free installations.

BRAZING NEWS No. 61 tells why leading plumbing contractors across the country are turning to SIL-FOS and EASY-FLO pipe and tubing assembly.

Write for your copies today.



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ORIGINATORS OF EASY-FLO & SIL-FOS

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Low cost safety PREVENTS High priced damage

BS&B *Sealed Type* SAFETY HEAD

PROTECTION AGAINST REFRIGERANT LOSS

PROTECTION TO REFRIGERANT SYSTEMS

Refrigeration and air conditioning systems need protection from overpressure . . . for two good reasons: To guard against refrigerant loss—and to prevent damage to equipment. The BS&B Sealed Type Safety Head is designed to give you this protection. It's a pressure relief device guaranteed to be leak-proof. This low-priced, "throw-away" unit is simple and tamperproof . . . consists of brass flanges and silver rupture disc. This disc is designed to rupture at a pre-determined pressure. When this happens just install a completely new fitting, easily and quickly. There are thousands of BS&B Safety Heads in use for primary or secondary relief. They're available in a variety of pressures and inlet-outlet connections.

WRITE FOR FREE DESCRIPTIVE LITERATURE AND PRICES

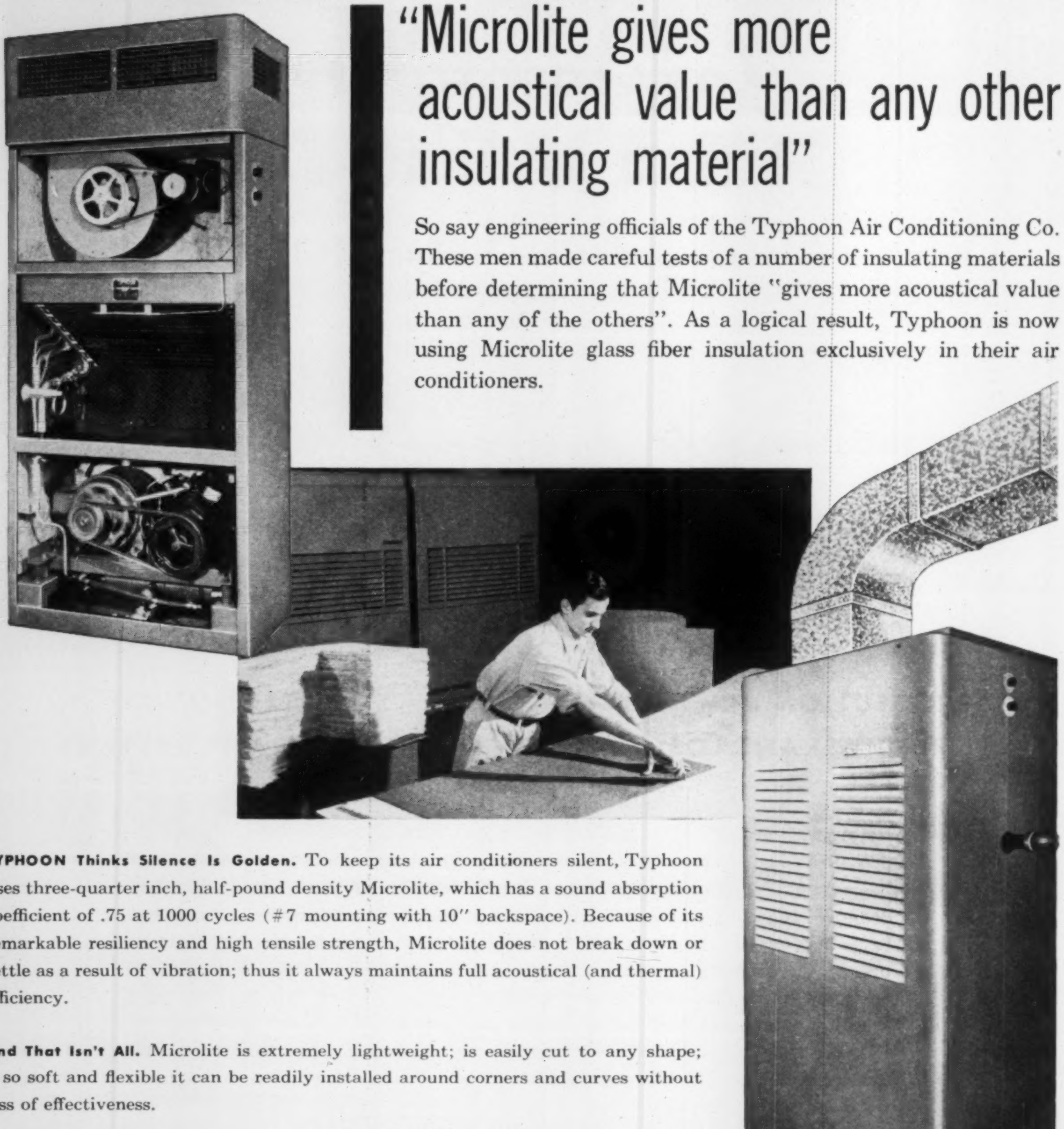
BLACK, SIVALLS & BRYSON, INC.

Safety Head Division, Dept. 2-DZ3
7500 East 12th Street
Kansas City 26, Missouri

SAFETY
OUR 60TH YEAR
BS&B
HEADS

TYPHOON uses **MICROLITE** because "Microlite gives more acoustical value than any other insulating material"

So say engineering officials of the Typhoon Air Conditioning Co. These men made careful tests of a number of insulating materials before determining that Microlite "gives more acoustical value than any of the others". As a logical result, Typhoon is now using Microlite glass fiber insulation exclusively in their air conditioners.



TYPHOON Thinks Silence Is Golden. To keep its air conditioners silent, Typhoon uses three-quarter inch, half-pound density Microlite, which has a sound absorption coefficient of .75 at 1000 cycles (#7 mounting with 10″ backspace). Because of its remarkable resiliency and high tensile strength, Microlite does not break down or settle as a result of vibration; thus it always maintains full acoustical (and thermal) efficiency.

And That Isn't All. Microlite is extremely lightweight; is easily cut to any shape; is so soft and flexible it can be readily installed around corners and curves without loss of effectiveness.

MICROLITE Goes Inside Ducts Too. Microlite duct liner is a most efficient, most practical acoustical duct insulation. You simply cut the desired size, adhere it to the metal and form the complete duct section in the brake.

For samples and a folder, write to Glass Fibers Inc., 1810 Madison Avenue, Toledo 2, O.

VITRON Glass Textile Yarns • Rovings • Micro-Fibers
DURAMAT Vapor Barriers • **BLUE FLAG** Pipe Wrap
MICROLITE Thermal and Acoustical Insulation
COUSTIC-AIRE and **THERMO-JET** Aircraft Insulations

GLASS FIBERS *INC.*

Makers of glass fibers by the ELECTRONIC-EXTRUSION process . . . developed, patented and used exclusively by Glass Fibers Inc.

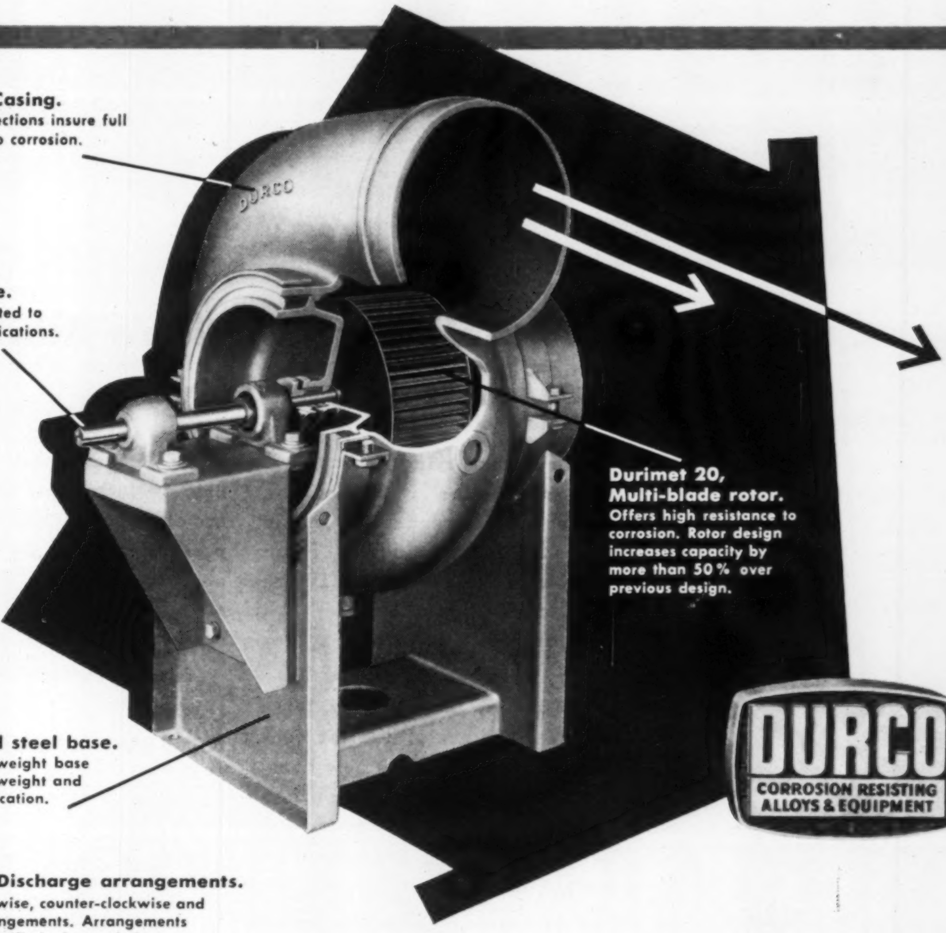
Corrosive fan installations can be ***permanent***

DURCO EXHAUST FANS ARE ALL-METAL

All parts in contact with corrosive fumes are solid metal—Duriron, Durichlor, Durimet 20 or other special DURCO alloys. Corrosion resistance is *throughout* the entire thickness of the metal section. Sizes, capacities, drives and alloys to fit requirements.

B-series fans (shown) are of an entirely new design. They're 30% lighter than previous comparative models, thereby increasing range of installation.

Write us for Bulletin F/1.



Duriron Casing.
All-metal sections insure full resistance to corrosion.

Belt drive.
Easily adapted to varied applications.

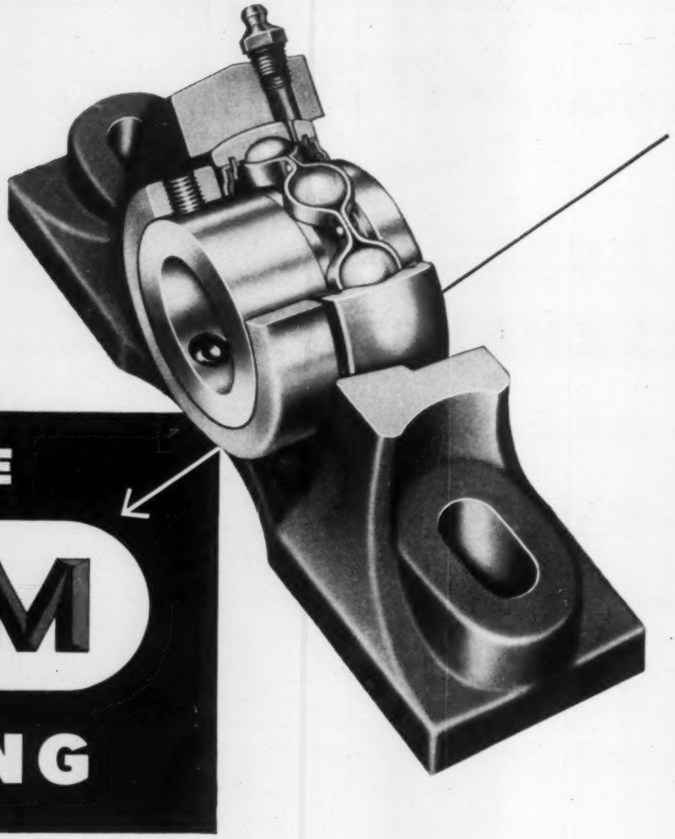
Durimet 20, Multi-blade rotor.
Offers high resistance to corrosion. Rotor design increases capacity by more than 50% over previous design.

Fabricated steel base.
Sturdy, lightweight base reduces fan weight and widens application.

Standard Discharge arrangements.
Include clockwise, counter-clockwise and angular arrangements. Arrangements should be specified when ordering.

DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT

THE DURIRON COMPANY, INC. / DAYTON, OHIO

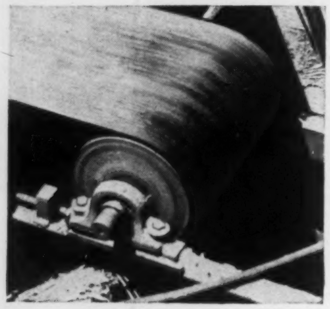


DODGE

SCM

BEARING

A wonderful new Ball Bearing Pillow Block by Dodge . . . for *medium* duty!



More load-carrying capacity . . . larger shaft sizes . . . plus all the features and dependability of the famous S C Ball Bearing line! These are the qualities provided in Dodge S C M, a new line of mounted ball bearings, available in both pillow blocks and flange cartridge type.

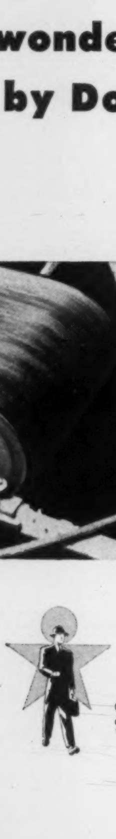
Designed for medium duty, these new bearings are of heavier construction, with complete new housings. Metallic-backed Neoprene seals keep lubricant in, dust and dirt out of the bearing. Engineered to stay put, *the seal won't blow!*

S C M bearings are new members of the famous Dodge 30,000 hour line, all of which are sealed, both on and off the shaft. Fully assembled and pre-lubricated at the factory, they are ready to slip on the shaft. Available from Distributors' stocks in shaft sizes from 1-7/16" to 3-7/16".

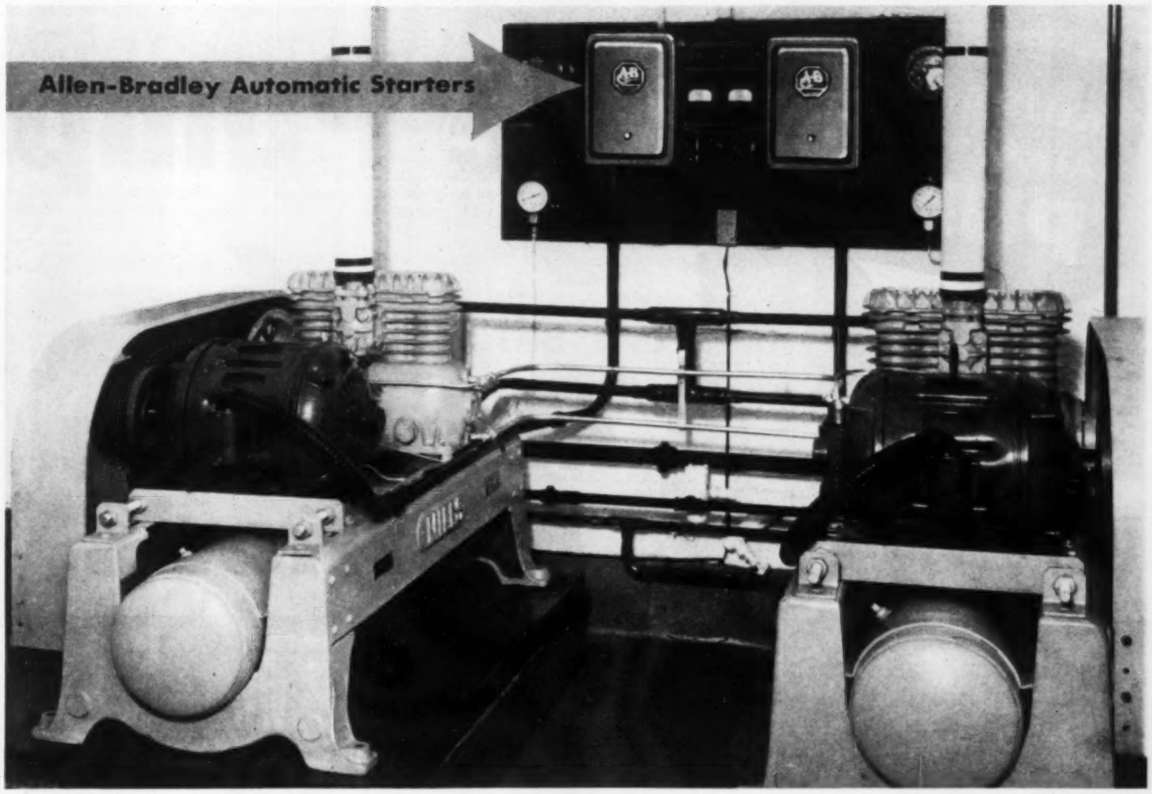
Write for bulletin with complete specifications.

DODGE MANUFACTURING CORPORATION
1600 UNION ST., MISHAWAKA, INDIANA

DODGE
of Mishawaka, Ind.

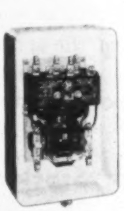


CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone directory, or write us.

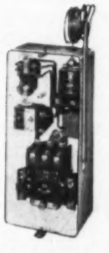


REFRIGERATION MOTOR CONTROLS that are Trouble Free

TYPICAL ALLEN-BRADLEY REFRIGERATION CONTROLS


Bulletin 709 Automatic Solenoid Starter

Temperature Control


Special Refrigeration Control Panel

Why are Allen-Bradley automatic starters so popular for refrigeration and air-conditioning service?... Because they are so trouble free and dependable. Why are they trouble free? Because all A-B starters have only ONE moving part. No pivots, pins, or bearings to corrode or stick ... no jumpers to break. You install them . . . and forget them! No contact maintenance . . . Allen-Bradley cadmium silver alloy contacts never need cleaning, filing, or dressing. A time-saving and money-saving "plus value."

Dependable overload relays . . . Allen-Bradley thermal relays are accurate and remain accurate "on the job" . . . even after years and years of service.

The Allen-Bradley trademark stands for "Quality" in motor control. Remember to specify Allen-Bradley—over the years you'll be money ahead!

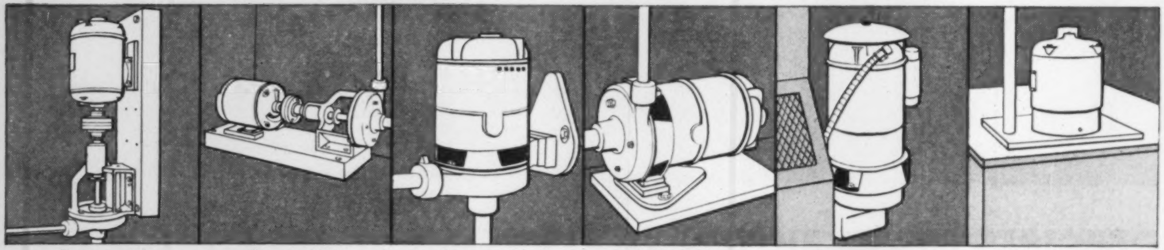
Allen-Bradley Co.
1335 S. First St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Limited, Galt, Ont.

A-B
Quality

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

ALLIS-CHALMERS Air Conditioning PUMPS

One Pump ...6 Mounting Methods



Base mounted, vertical

Base mounted, horizontal

Close-coupled, vertically mounted

Close-coupled, horizontally mounted

Tank wall mounted

Submerged mounted

makes easier installation for you

YOU CAN SOLVE MANY DIFFICULT INSTALLATION problems by using Allis-Chalmers air conditioning pumps. You can get a single set of operating characteristics using four different models that can be installed in any of six different ways. You can choose the mounting method easiest for your job without having to figure a different pump each time.

Engineering Assistance

Your Allis-Chalmers representative or distributor is an experienced, highly qualified specialist who will give you full cooperation every step of the way. He'll help you pre-engineer the setup. Many times he can make valuable suggestions which will result in a simpler, more effective installation.

Delivery from Convenient Stock

Allis-Chalmers air conditioning pumps in a wide range of types and sizes are carried in stock by Regional Warehouses and Authorized Distributors throughout the country. A-4577

Electrifugal is an Allis-Chalmers trademark.

ALLIS-CHALMERS
PACKAGE PUMPS for AIR CONDITIONING

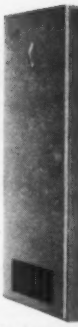
For literature on Allis-Chalmers
FHP Package Pumps get Bulletin 52B7529 . . . *Electrifugal* Pumps, Bulletin 52B6140 . . . Supporting Adaptor Pumps, Bulletin 52B6083 . . . Vertical Mounted Pumps, Bulletin 52B6975. Write Allis-Chalmers, Milwaukee 1, Wisconsin.

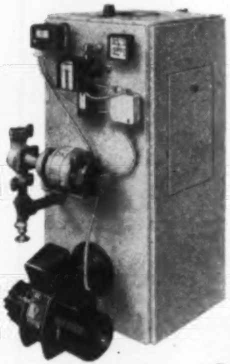
ALLIS-CHALMERS

First the Burnham PACEMAKER*

High Quality—Economical Performance—Low Competitive Cost

Because of its low cost and new, efficient design this exclusively oil fired boiler immediately hit the jackpot of popularity. Vertical flue travel – long life cast-iron construction with storage or tankless type heaters for plenty of domestic hot water made it a solid hit with homebuilder and heating contractor alike.





Then the Burnham PACE-PAK*

A Factory Assembled Cast-Iron Oil Heating Unit Delivered In One Crate Ready for Easy Installation

Another Burnham success, a design based on PACEMAKER but packaged for quick installation, all controls and wiring factory installed to insure top bracket service from the start – optimum performance with minimum servicing. Also equipped with Burnham's efficient tankless water heater for plentiful, year 'round domestic supply.

* Reg. U. S. Pat. Off.

Now the Burnham PACE-KING

For Apartment Houses, Schools, Hospitals and Commercial Installations

Engineered on the same design lines as its predecessors PACE-KING brings to the larger boiler field a highly efficient vertical-flue-travel boiler—exclusively oil fired. The features listed below make this an outstanding boiler buy:

1. Vertical Flue Travel – Low Stack Temperature – In PACE-KING's 24" of vertical flue travel the flue gas temperatures are reduced 800 degrees. This means low stack temperatures, emphasizing the tremendous heat absorbing qualities of PACE-KING's vertical flue travel over thousands of scientifically proportioned fins.
2. Low Draft Loss and Lower Chimneys – Each section of PACE-KING has its own outlet direct to the smokehood – this makes possible scientifically correct flue ways regardless of the number of sections in the boiler. The net results are low draft loss and lower chimneys — very desirable factors in building design.
3. Loose Baffles – You won't find any in PACE-KING. PACE-KING's efficient design and special construction features eliminate any need for them. No problem of loose baffles being dislodged or burned through after a short period of operation.
4. Tankless Hot Water Heaters – This unusual large-boiler feature – specially designed all-copper coils in capacities from 6 to 10 gals. per minute – assures plenty of economical, automatic hot water for laundries, kitchens or baths on a year 'round basis.

PACE-KING is available in 14 sizes with IBR ratings for steam from 1,100 to 4,500 sq. ft. and for hot water from 1,925 to 7,200. Sections are reversible and boiler can be fired from front or rear. Mail the handy coupon today for folder giving full information.

BURNHAM BOILERS WEAR LIKE IRON BECAUSE THEY'RE MADE OF IRON

Burnham

BURNHAM CORPORATION
Irvington, New York

Burnham Corporation HP-35
Irvington, New York

Please send illustrated folders giving full data on

☐ PACE-KING ☐ PACEMAKER ☐ PACE-PAK

Name

Address

City State

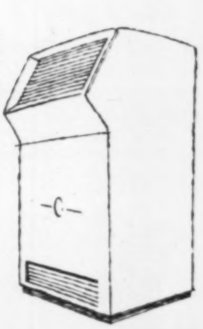
Wagner®
ELECTRIC MOTORS
...the choice of leaders in industry

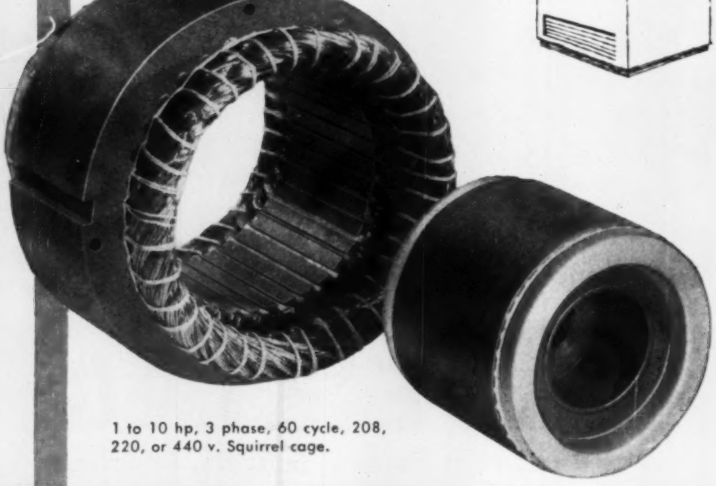
specify Wagner® HERMETIC MOTORS...

to provide the best in sealed-unit performance

POLYPHASE

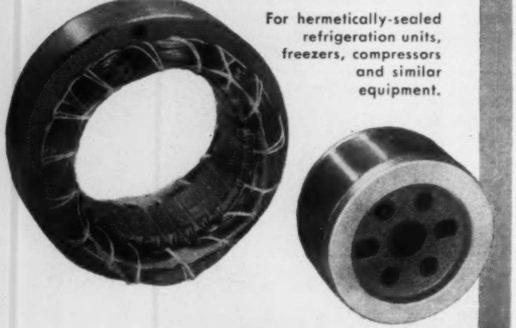
For sealed refrigeration units, air conditioners, commercial refrigeration and similar applications.



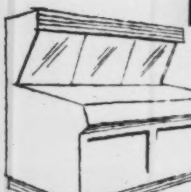


1 to 10 hp, 3 phase, 60 cycle, 208, 220, or 440 v. Squirrel cage.

For hermetically-sealed refrigeration units, freezers, compressors and similar equipment.



SINGLE-PHASE



¼ to 5 hp, 60 cycle, 115 or 230 v. Split Phase, Capacitor-start induction run, Capacitor-start and run.

When you design or build a hermetically-sealed air-conditioning refrigeration condensing unit—choose your motor drive with care. You can't afford to take chances. Remember it's *your product* that gets the blame if the motor fails.

Wagner hermetic motors, like Wagner general-purpose motors, are known for their ability to give years of trouble-free service. Refrigeration manufacturers who use Wagner hermetics know that each motor will meet their rigid requirements for quality, uniformity and dependability.

That's because every Wagner hermetic motor is precision-built and carefully tested. They are backed by more than sixty years of motor building experience.

When your motor drives are to be hermetically sealed, it's to your advantage to specify *Wagner* for use on your equipment. Get the facts . . . call the nearest of our 32 branch offices, or write us.

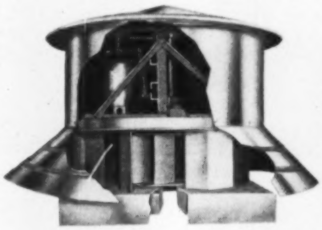
Wagner Electric Corporation
EST. WEC 1891

WAGNER ELECTRIC CORPORATION
6370 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

- ELECTRIC MOTORS
- TRANSFORMERS
- INDUSTRIAL BRAKES
- AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

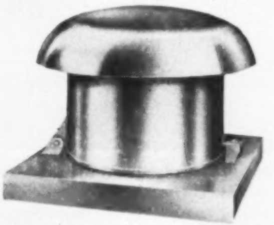
BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

M55-5



GYRA-FLO ROOF EXHAUSTERS

Engineered for extremely quiet operation in schools, institutions, churches, etc.—wherever roof ventilation is practical. Air capacities: 830 to 29,750 CFM—Static pressure: 1/8" to 3/4". Bulletin GPE-103.



AXIAL MUSHROOM EXHAUSTERS

Designed for rugged industrial or commercial applications where an extremely low operating noise level is less important. Air capacities: 870 to 47,800 CFM—Static pressure: up to 1½". Blade diameters: 14" to 48". Bulletin CAM-102.

CHICAGO

POWER ROOF EXHAUSTERS

So *silent*, they're practically *unheard*—so compactly designed, they're almost *unseen*—so engineered, they can be depended on to move air in measured volume according to accurate, certified ratings. Operating costs are low—with maintenance at a minimum.

It pays to use "Chicago" Power Roof Exhausters for dependable ventilation in institutions and industry. "Chicago" Power Roof Exhausters pay their way in safeguarding health and in creating a better atmosphere in which to live, work, study, or play. They assure *quieter* ventilation with long range economy. There's a type and size for every requirement.

Write for FREE Detailed Bulletins Today!
See your local classified directory under "Fans-Blowers" for your nearest "Chicago" Engineer

CHICAGO BLOWER CORPORATION
9867-HP-3 Pacific Ave., Franklin Park, Ill. GLadstone 5-4780

Now!
a new, molded
silica insulation
developed by
Johns-Manville
Insulation Research
✓Can't shrink...

Fibrocel alone offers all these advantages

- No shrinkage—eliminates gaping joints
- Resists compression—firm in structure
- Uniform dimensions—precision formed for exact fit
- Economical application—lightweight, easy to cut with a knife
- Thermal effectiveness
- Permanence—flame, rot, odor and vermin proof

Can be easily installed—Fibrocel is light, easily cut with a knife. Uniform dimensions assure tight, smooth joints and neat appearance.

Johns-Manville *first-in*

✓Resists deformation...

✓Easier to apply...

FIBROCEL®

PIPE INSULATION

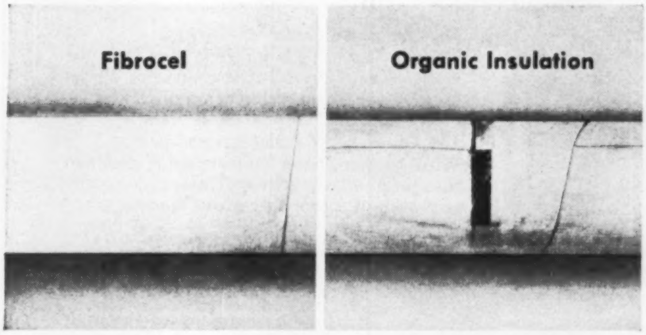
For plumbing, heating and air conditioning systems

● Johns-Manville Fibrocel is an entirely new concept in pipe insulation for the 35F to 300F temperature range. In the manufacturing process tiny particles of silica are exploded and expanded to form a cellular structure of "dead" air spaces. It incorporates in one material a combination of properties not found in any existing insulation for heating and plumbing service.

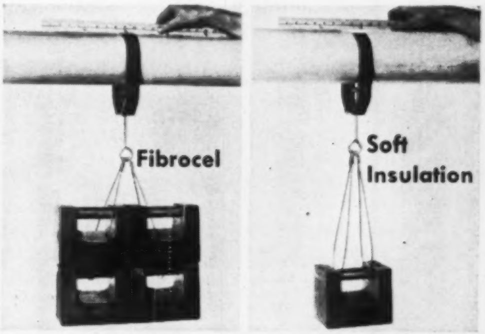
Fibrocel completely eliminates objectionable shrinkage caused by atmospheric changes. It permits no gaping, unsightly joints with accompanying heat leakage. Strong and firm in texture, Fibrocel resists deformation. Dimensionally uniform, it provides exact fit and neat appearance. Light in weight, it is readily handled. Fibrocel speeds application, keeps costs at a minimum.

This new insulation has been developed and tested in the world's largest insulation laboratory, located at the Johns-Manville Research Center. It has been proved in actual field installations. And it is backed by more than 96 years of Johns-Manville experience in insulation engineering.

Available now—Fibrocel is in commercial production. Architects, contractors, and engineers can secure full information from J-M District Offices. Or write for Brochure IN-155A, address Johns-Manville, Box 60, New York 16; in Canada, 565 Lakeshore Road East, Port Credit, Ont.



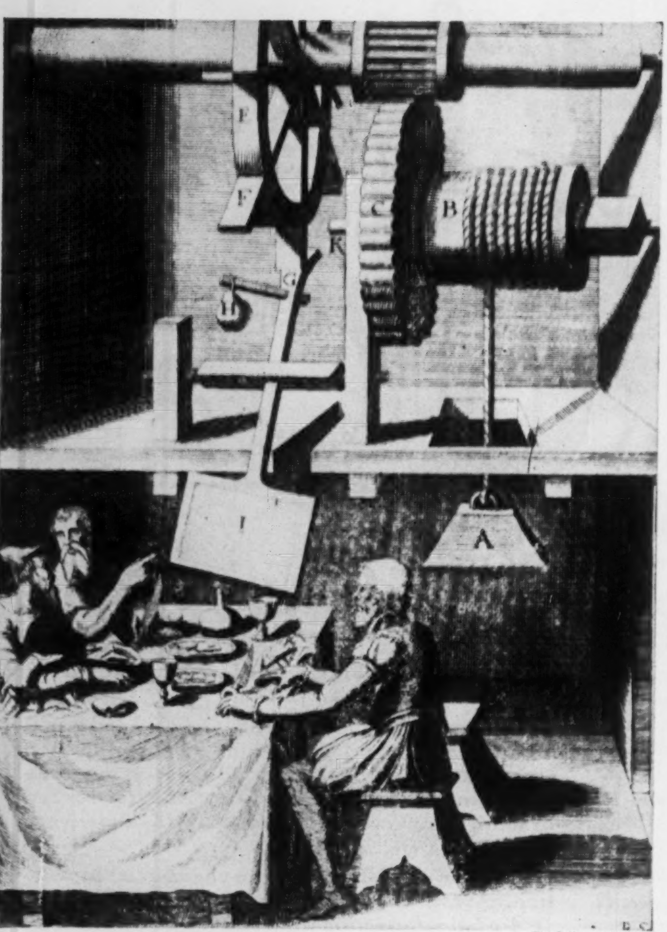
Joints stay tight—tests prove Fibrocel does not shrink, even after severe moisture exposure and service under continuous steam flow. Ordinary organic insulation shows substantial joint shrinkage after same test.



Withstands compression—tests prove Fibrocel suffers no deformation or compression even under 200-lb. weight. Softer type insulation shows marked deformation after being subjected to 50-lb. weight.

INSULATION MATERIALS · ENGINEERING · APPLICATION

JOHNS-MANVILLE
JM
PRODUCTS



The Bettmann Archive

Here's somebody's idea of how to solve the ventilating problem—with a gravity engine—back in 1662. Today Airtemp can help you solve your clients' air conditioning problems.

Whatever your Air Conditioning problem—

AIRTEMP

is ready to help you!

Airtemp offers these "pluses" to those planning commercial and industrial air conditioning

Airtemp has the Right Equipment

To meet your *every* air conditioning need, Airtemp has a complete line of precision-built equipment—conventional or specially engineered—for a room or a building.

Experienced Engineers "at Your Service"

You are offered the advisory services of engineering specialists—pioneers in commercial and industrial air conditioning—through Airtemp Construction Corporation, a subsidiary of Chrysler Corporation.

You Deal with a Leader

The Chrysler name is widely known. Over the years, it has gained public confidence for its leadership in quality and engineering.

Low Cost Result of Peak Efficiency

With Airtemp, both the installation cost and the operating costs are low. This extra economy is a result of Airtemp's extreme efficiency.

Nationwide Service Organization

You are guaranteed dependable local service by Airtemp's network of personnel and facilities.

AIRTEMP SOLVES VARIED INSTALLATION PROBLEMS

Ostheimer Building, Philadelphia, Pennsylvania. Owners: Ostheimer Realty Company. Architects and Engineers: The Ballinger Company.

Roosevelt Hotel, Waco, Texas. Consulting Engineer: P. N. Vinther, Dallas, Texas.

Title Guaranty Building, St. Louis, Mo. Architect: Raymond E. Maritz; Consulting Engineers: Leo S. Weil and W. B. Moses; Mech. Engineers: Brussel & Viterbo; Air Conditioning Contractors: General Installation.

HOW YOU GET THIS SERVICE—For complete information on Airtemp's service, simply write to: Airtemp Division, Chrysler Corporation, Dept. HPAC-3-55
Dayton 1, Ohio

AIRTEMP
Comfort Zone

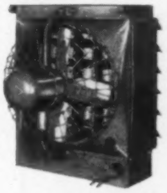
Airtemp
DIVISION OF CHRYSLER

AIR CONDITIONING • HEATING FOR HOMES, BUSINESS, AND INDUSTRY

ILG
Costs less to install–
costs less to operate
ROTATION

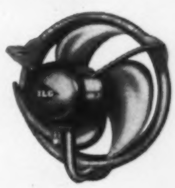
ILG Power Roof Ventilators

Long-lasting, quiet, easy to install, leak-proof—provide efficient ventilation independent of wind and weather.



ILG Unit Heaters

The complete line—steam, hot water, gas or electric—with capacities ranging from 18,600 BTU to 286,000 BTU.



ILG Propeller Fans

Feature ILG's self-cooled motor, direct connected to fan wheel—assures extra quiet, low-cost operation. Sizes from 6" to 72".

INSTALL Ilg CENTRIFUGAL FANS

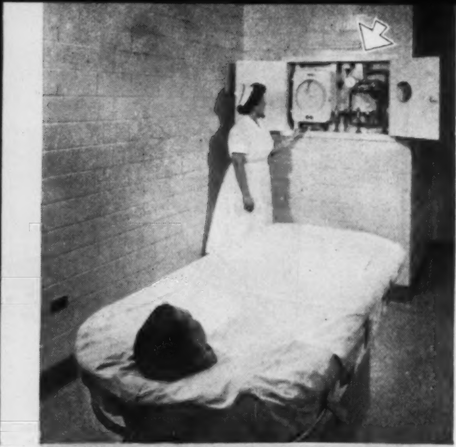
Costs less and lasts longer for such tough-job installations as fume hood or spray booth duct ventilation—wherever exhaust or supply of air through duct systems is required. It features the *direct connection* of the ILG-built motor to the fan wheel to assure permanent alignment, elimination of extra installation cost, noise, power waste of belts and pulleys, permit easy installation on floor, wall or ceiling. Six types . . . with a wide range of capacities.

Get This Free Bulletin!

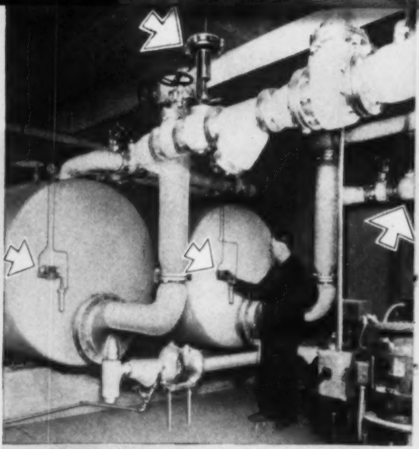
Here is complete mechanical and performance data on Ilg's popular "BC" Centrifugal Fan shown above—Bulletin 248. For general information on Ilg Centrifugal Fans, ask for Bulletin S 314.

ILG ELECTRIC VENTILATING CO.
N. Pulaski Road, Chicago 41, Illinois

Powers Thermostatically Regulated Showers



Continuous Flow Bath—Note Powers Control Cabinet



Large Water Heaters—Powers Controlled

HINSDALE, ILL. SANITARIUM AND SHOWS DIVERSITY OF POWERS

★ FOR HEATING ★ AIR CONDITIONING ★ WATER HEATERS ★ HYDRO-THERAPY ★ SHOWER BATHS

Few 200 bed institutions are as well equipped to save and prolong lives as Hinsdale's Sanitarium and Hospital

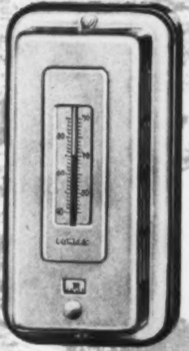
It's six operating rooms, X-Ray department (including a 250,000 volt deep-therapy machine for cancer treatment), delivery rooms, beautiful nursery and obstetrical department are all equipped with the best modern equipment.

Outstanding Polio Treatment Center. Facilities here can accommodate up to 30 polio patients and keep them in complete isolation.

Three iron lungs, rocking beds, steam rooms and many types of hydro-therapeutic baths under the care of skilled attendants provide patients with the best service obtainable.

Comfort and Safety of Patients here is assured by the dependability of Powers thermostatic controls used throughout the building.

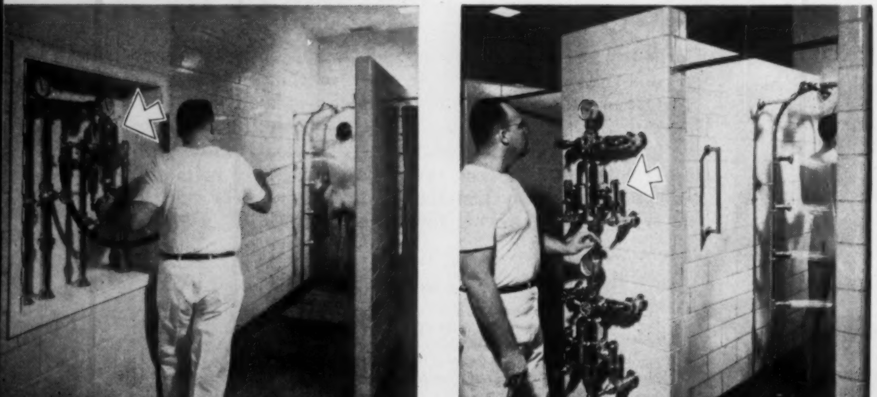
When you want help in selecting the right type of control for hospitals or any other type of building, call in an experienced Powers engineer. There's no obligation. (b86)



THE POWERS REGULATOR COMPANY

SKOKIE, ILL. • Offices in Over 50 Cities in U. S. A., Canada and Mexico

OVER 60 YEARS OF AUTOMATIC TEMPERATURE CONTROL



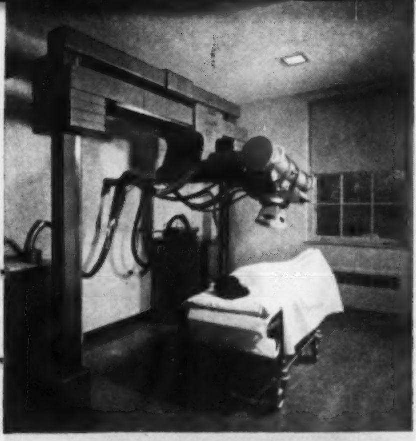
Scotch Douche and Hydrotherapeutic Showers are Both Powers Controlled

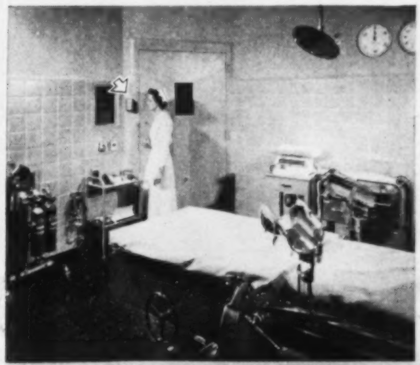
One of Three Iron Lungs in Children's Room

Steam Rooms Regulated by Powers Thermostats

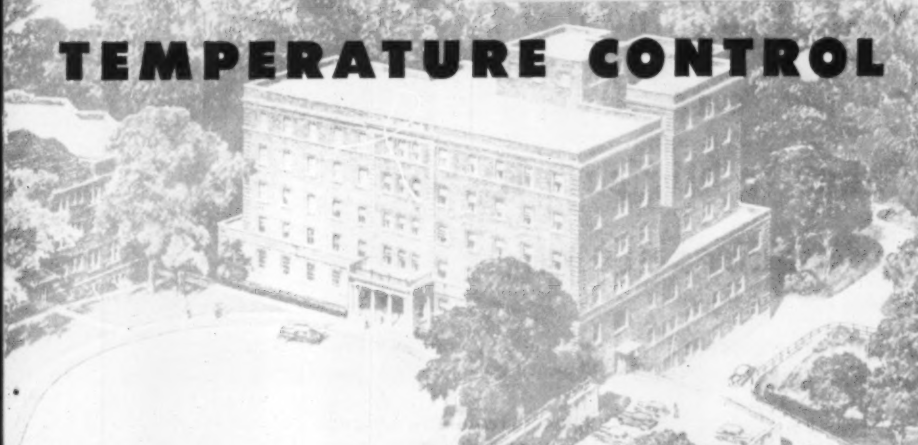
Architects and Engineers: **Fugard, Burt Wilkinson and Orth** • **Edward G. Halstead**
General Contractor: **E. H. Marhoefer Jr. Co.**
Contractors: **Thomas J. Douglass & Co.** (Heating) • **Charles E. Gazin** (Plumbing)
Plumbing Fixtures: **American-Standard**
All of Chicago, Ill.

HOSPITAL TEMPERATURE CONTROL


Deep Therapy X-Ray Room

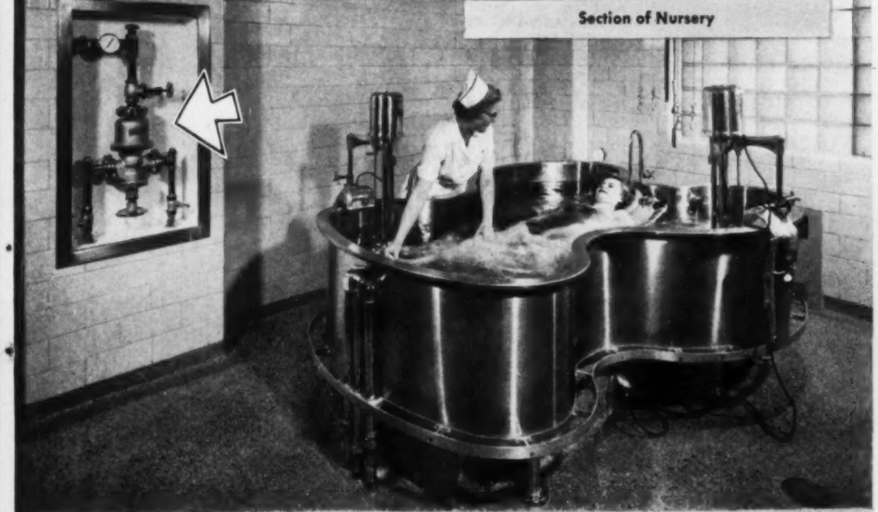

Air-Conditioned Delivery Room

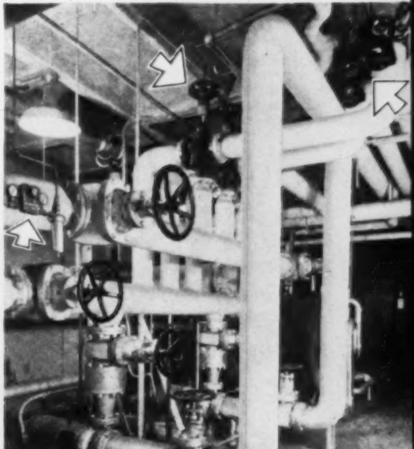
Powers Control on Sitz Bath with Raised Base



Treatment Bath for Children. Note Powers Mixer

Section of Nursery

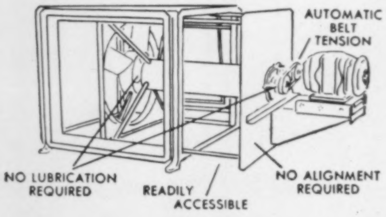

Powers Controlled Whirlpool Bath for Polio Patients

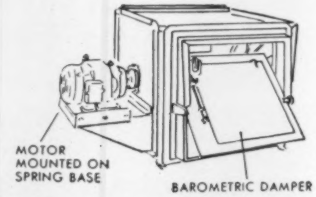

Controls on Forced Hot Water Heating System

"This Wing Draft Inducer is great! I don't have to touch it... never have to lubricate it... it never requires attention"

The new Wing Draft Inducer has many unique features:

- ★ Gas Inlet may be at top, bottom or any side—may easily be changed in the field.
- ★ Unit may be withdrawn from casing for inspection or service.
- ★ No lubrication required—Presealed bearings air-cooled.
- ★ No alignment required—no need for field alignment before start-up.
- ★ Motor belt always at correct tension.


AUTOMATIC BELT TENSION
NO LUBRICATION REQUIRED
READILY ACCESSIBLE
NO ALIGNMENT REQUIRED


MOTOR MOUNTED ON SPRING BASE
BAROMETRIC DAMPER

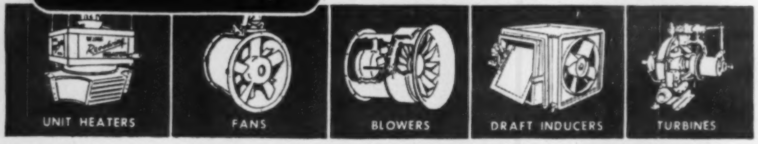
Write for a copy of Bulletin I-55

Wing

L. J. Wing Mfg. Co.

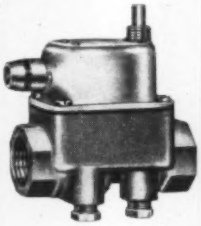
140 Vreeland Mills Road
Linden, New Jersey

Factories at Linden, N. J. and Montreal, Canada

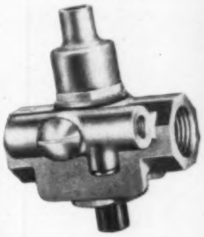

UNIT HEATERS
FANS
BLOWERS
DRAFT INDUCERS
TURBINES

a SAFE BET

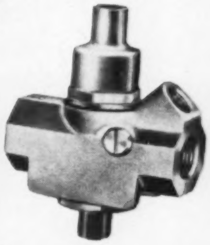
on any gas appliance



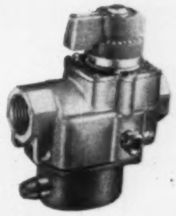
MR-2 Thermopilot Valve —Single Couple Model —provides automatic gas line shutoff when pilot fails, 100% shutoff when pilot tap is downstream.



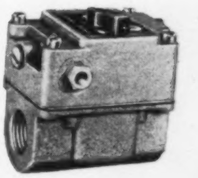
MR-3 Thermopilot Valve —Nonflow Interrupter Type—automatic gas line shutoff. Independent auxiliary pilot valve permits downstream installation from main control shutoff.



MR-4 Thermopilot Valve —Flow Interrupter Type. Provides automatic burner gas shutoff when pilot fails —offers safe lighting while reset button is depressed.



MR-5 Gas Cock Safety Valve—Single Couple Type. Provides plugcock shutoff and automatic valve 100% safety. Makes pilot relighting safe and simple. Gas cannot reach main burner before pilot is lit.



MR-8 Thermopilot Valve —Single Thermocouple Model. Provides line shutoff and 100% safety. 3 stage reset knob (On, Off, Light Pilot) shows valve position at a glance.

A safe bet you have an extra sales advantage

Some people buy for economy. Some want the best at any price. But *safety* rings the bell with everyone! That means, on any gas appliance, an automatic safety valve is one of your *better* sales features. And when it is General Controls (operating on the proved thermocouple principle)—it's the *best!* Point to the famous General Controls red shield and tell your prospect it is his best assurance of dependable performance—a safe bet for lasting *safety!*

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Safety Shut off
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GENERAL CONTROLS

PLANTS: GLENDALE, CAL. • BURBANK, CAL.• SKOKIE, ILL. • 38 BRANCH OFFICES SERVING THE NATION

America's Finest Automatic Controls

MANUFACTURERS OF AUTOMATIC CONTROLS FOR THE HOME, INDUSTRY, AND THE MILITARY

40

reasons why
any service requiring
BRONZE GATES
can be planned for
lasting economy

Look over the list of 40 patterns in Jenkins' complete line of Bronze Gates. You'll find the valve you need in this new folder, with details of the *extra value* design and construction that makes Jenkins the best buy for any service. Get this folder, use it to plan your hookups for lasting valve economy.

FOR ANY SERVICE---THERE'S A JENKINS BRONZE
THAT WILL LOWER MAINTENANCE---LAST LONG

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DIFFERENT GATES TO
VALVE SATISFACTION
125 lb. - 150 lb. - 200 lb.
300 lb. - 350 lb. PATTERNS
including
SOLID WEDGE
SPLIT WEDGE
INSIDE SCREW
OUTSIDE SCREW AND YOKE
STATIONARY SPINDLE
TRAVELING SPINDLE
SCREW-IN BONNET
BOLTED BONNET
UNION BONNET
QUICK OPENING
SOLDER END
SOCKET END
plus RADIATOR, HOSE END
and UNDERWRITER GATES

SOLID BRONZE OR WEDGE
UNION BONNET
TRAVELING SPINDLE

SOLID WEDGE
SCREW IN BONNET
TRAVELING SPINDLE

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STATIONARY S

SPLIT WEDGE
UNION BONNET
TRAVELING SPINDLE

SOLID WEDGE
UNION BONNET
TRAVELING SPINDLE

SOLID WEDGE
OUTSIDE SCREW & YOKE
RISING SPINDLE

SOLID WEDGE
OUTSIDE SCREW & YOKE
RISING SPINDLE

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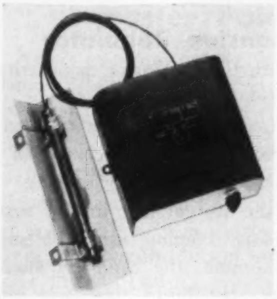
EQUIPMENT DEVELOPMENTS . . .

For reviews of Recent Trade Literature see Page 284

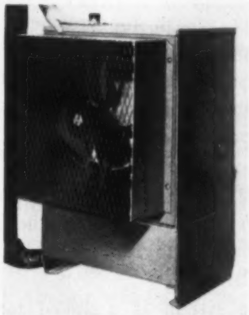
Remote Heating Control



Maximum flexibility with simplified settings for easy adaptation to heating requirements of multiple occupancy buildings are features of a new "Weather-Man" control, says its manufacturer.

The unit has a remote outside temperature sensitive bulb. The regulator case is installed indoors. Heat is controlled by a program dial which automatically controls heat input during the day, provides night setback and a morning buildup period — all adjusting according to weather changes, the company reports. Automatic Devices Co., Inc., 714 Hillgrove Ave., Western Springs, Ill.

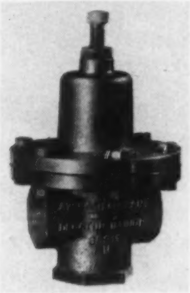
Cooling Tower, Condenser



All copper construction of wetted deck surfaces and eliminators is a design feature of the manufacturer's new line of water savers. Since copper cannot rust or rot, this type of construction solves the problem of deterioration, says the company.

With another feature, interchangeability of parts, the unit can be arranged as a CDT cooling tower or IEC evaporative condenser by utilizing either the "Inner-Fin" coil or the copper decking, according to the manufacturer. Whichever type is desired can be equipped with either blower or propeller fan. Bush Mfg. Co., 179 South St., West Hartford 10, Conn.

Regulating Valve



Type "1260," a newly designed pressure reducing and regulating valve with low pressure drop and lockup, is a self contained, single seat unit operating within a range of 300 psi inlet pressure and 3 to 250 psi delivered pressure, its manufacturer announces.

The velocity of gas or liquid passing the venturi orifice creates suction, reducing pressure in the lower diaphragm chamber and opening the valve wider to produce a lower pressure drop, according to the company. The valve is designed for use with water, gas, steam, air, oil and other noncorrosive liquids. A. W. Cash Co., P.O. Box 551, Decatur, Ill.

Centrifugal Pump

The manufacturer's stainless steel "Centri-Chem(R)" pump has a new pedestal mount designed to permit belt drive or direct coupling with standard motors. The unit, used for the handling of materials like antibiotics, viscous corrosives, hydrogen peroxide and aromatic solvents, was previously offered as a close coupled unit only, the company reports.

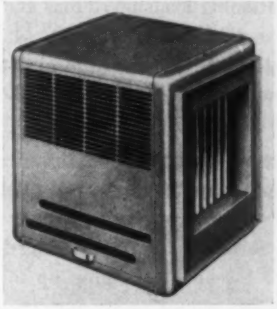
Reduced overhang permits the pump to be rotated in any position without obstruction by pedestal parts, says the manufacturer. Heavy pads are designed to reduce vibration when the unit is mounted on a concrete or steel bed plate. Eco Engineering Co., 12 New York Ave., Newark 1.

Steam Trap

In this new steam trap, the kinetic energy of steam closes the valve, the company reports. The only moving part is the valve head, a solid heat treated stainless steel disc, which requires very little maintenance, according to the manufacturer. The same head and seat are used for pressures to 600 psi and temperatures to 950 F, the company says.

Operating characteristics cited by the manufacturer are: closes tight on no load and operates against a back pressure up to 50 percent of its inlet pressure, discharges condensate at saturated steam temperature as it forms, can vent both air and air-steam mixtures. Sarco Co., Inc., Empire State Bldg., New York 1.

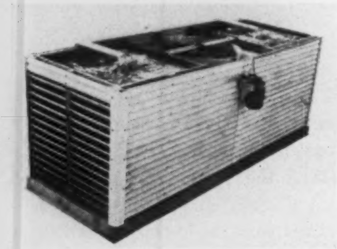
Large Duct Furnaces



Featuring sectional assembly to simplify installation, the manufacturer's new series of large capacity duct furnaces is designed to make possible heating systems with capacities of over 2 million Btu using sections weighing only 315 pounds, the company says.

Units are equipped with a full complement of combustion controls. All other components are selected to meet the requirements of each installation. Engineered as an integral part of the duct system itself, furnaces are available for either suspended or base mounting, the manufacturer reports. Reznor Mfg. Co., Mercer, Pa.

Induced Draft Tower



This new induced draft cooling tower has been engineered to meet the trend toward longer, lower lined buildings and to answer the demand of metropolitan buildings where units must still be mounted on the roof, by providing a low silhouette which can be easily concealed, according to the manufacturer.

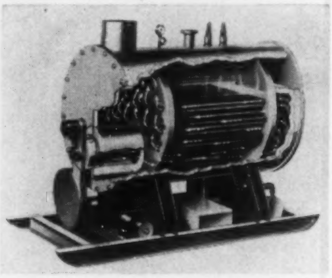
While the tower is designed for conventional external water supply piping, concealed internal piping is optional, the company says. A range of sizes is available to handle air conditioning loads of 75 tons and up, the manufacturer reports. J. F. Pritchard & Co. of California, 4625 Roanoke Pkwy., Kansas City 12, Mo.

Water Treatment

The manufacturer's new "Nalco 400" water treatment system uses four formulas for conditioning feedwater for boilers ranging up to 300 psi, the company announces. Depending on an analysis of the feedwater, one of the formulas may be selected to provide treatment for prevention of scale, corrosion and foaming in the boiler, according to the manufacturer.

Each formula is produced in ball briquettes about 3 in. in diameter and weighing 1 lb, to save the user the time and trouble of mixing and weighing a variety of materials. National Aluminate Corp., 6277 W. 66th Pl., Chicago 38.

Boiler Tube Design



In transferring heat in the boiler shown above, internally finned tubes produce a fire-side to water-side surface almost 3 1/3 times the surface area of plain bare tubes, the manufacturer states.

In addition, this finning is designed to increase the turbulency of the hot gases and bring them into more intimate contact with the heat transfer surface. Brown Fintube Co., Elyria, Ohio.

Air Conditioner

The "Royal-Aire" water cooled packaged air conditioner can also be equipped with a heating coil, its manufacturer announces. The unit has a pump down control system designed to insure that a minimum of gas remains at low pressure in the coils when the machine shuts down.

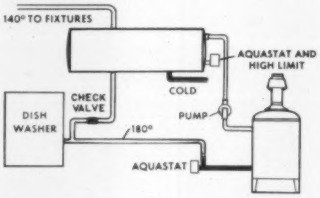
All service connections are easily accessible and the blower section is constructed so that it can be used for either vertical or horizontal discharge, the company says. Union Asbestos & Rubber Co., Heating and Cooling Div., 332 S. Michigan Ave., Chicago.

Expansion Regulator

With the increasing popularity of convector and baseboard type radiation, the manufacturer's expansion regulator facilitates controlled expansion and constant pressure without the use of air in the system, therefore keeping air problems at a minimum, the company states.

The unit "is a time and money saver since it does away with automatic air vents on the radiation, air vents on the mains, the automatic fill valve, accessories used to divert air back to the expansion tank, and the expansion tank itself," according to the manufacturer. American Tube Products, Inc., Riverdale Bldg., Natick, R.I.

Water Heating System



Shown is a two temperature water heating system for commercial installations employing the manufacturer's line of volume water heaters. The tank is maintained at a temperature of 140 F for general purpose water distribution. For high temperature purposes, the water is drawn from the tank to the heater and boosted to 180 F, the company reports.

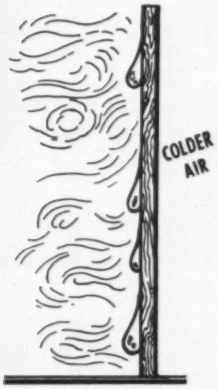
The system is designed to automatically maintain the temperature in the transmission line and assure high temperature water when needed. A. O. Smith Corp., Box 584, Milwaukee 1.

Roll Bonded Aluminum

"Roll Bonding" is the name given to the manufacturer's patented process by which an aluminum sheet

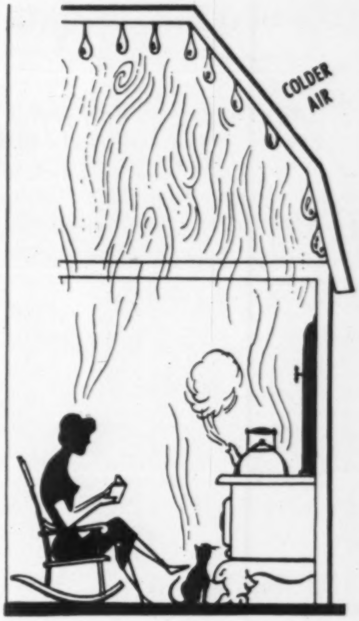
How to Reduce CONDENSATION!

Prevent Damage to Wood, Plaster, Paint, etc.



Condensation forms when temperature of contacting air is reduced below dew-point by a cold surface.

Condensation forms when the capacity of an air space at a given temperature is too small for the amount of vapor present. →



As air becomes colder, it can hold less vapor in suspension. The degree of saturation increases until a dew-point is reached and condensation occurs.

Heat flows from warm to cold by conduction. A material which is in contact with air colder than itself on one side and air warmer than itself on the other side, will *continuously* extract heat from the warmer air by conduction and lose it to the colder air. As the contacting warmer air becomes cooler by this action, the amount of vapor it can hold in suspension without condensing becomes smaller.

The denser and bulkier the material, the more heat it can extract before attaining room temperature, if it *ever* does. The scientific construction of multiple layers of accordion aluminum, fiber and air spaces minimizes condensation formation on or within this type of insulation, when installed in building spaces.

THE REASON CONDENSATION IS MINIMIZED

Since the sheet of aluminum adjacent to the warm, inner air of a building weighs only about ¼ oz. per sq. ft., it does not need to extract much heat from that air to attain and remain at room temperature. Since the emissivity of the aluminum surface is only 3%, little heat is lost by radiation and this further enables the aluminum to remain at about room temperature and not extract much heat from that warmer air.

Since the other sheets of aluminum and fiber retard heat flow by inner as well as outer convection, and since conduction is slight through the preponderant low density air spaces, the sheet's other surface faces a space which is only a *little* colder than the aluminum itself. But because warmth flows to cold in conduction, the aluminum will *give off a slight* amount of *heat* to the colder space, thereby slightly *increasing* the vapor retaining capacity of that space. The successive reflective spaces and sheets of aluminum and fiber behave similarly. Since each aluminum surface is slightly warmer than the air it faces on its cold side, there is no extraction of heat *(The reverse is true.)*

CONTINUOUS, IMPERVIOUS VAPOR BARRIER

When multiple accordion aluminum is used, fortuitous vapor and water (like rain) which intrude into building spaces will, as the vapor pressure develops therein, gradually flow out as vapor through exterior walls and roofs because vapor flows from areas of greater to less density. Since the vapor cannot back up through the continuous, almost impervious aluminum, it will flow out because exterior walls and roofs have substantial permeability in comparison with the aluminum, far greater than the required 5:1 ratio.

Of great importance is the use of a continuous metallic vapor barrier of zero water vapor permeability, without "breaks" every few feet, to retard the outward flow of vapor which originates inside the house. Infiltration under the flat stapled flanges of multiple accordion aluminum is slight.

To obtain MAXIMUM, *uniform-depth* protection against heat loss and condensation formation, it is necessary to use the new edge-to-edge multiple aluminum*, each sheet of which stretches from joist to joist, and also all through the flanges for further vapor protection as well as permanent attachment of each sheet.

The U. S. Bureau of Standards has prepared a helpful and informative booklet, "Moisture Condensation in Building Walls," which discusses causes and cures. Use the coupon to get a free copy from us.

*Patent applied for.

COST OF EDGE-TO-EDGE INFRA
Multiple Aluminum Insulation
installed in new construction between
wood joists, material and labor

Type 6-S under 9½¢ sq. ft.
Type 4-S under 7½¢ sq. ft.

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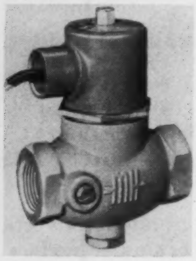
with integral passages for liquid or gas is being produced. While the immediate application for the process is for heat exchangers in the refrigeration industry, it is predicted that it will soon find use in the air conditioning field as well.

The process involves metallurgically bonding two sheets of aluminum together by applying a rolling pressure to them. Hydraulic pressure is then applied, opening the previously "printed" passageway pattern, the manufacturer reports. Reynolds Metals Co., 2500 S. Third St., Louisville 1.

Solenoid Valve



A new solenoid valve, using a spring loaded synthetic valve, has other features designed to facilitate more positive seal off, its manufacturer states. The special rubber "soft seat valve" is said to be durable and never require replacement and be soft enough to help reduce leakage caused by foreign particles which may lodge in the metal seat.

Other improvements cited include increased capacities, replaceable coils and use of a conical spring loaded plunger which presses the valve disc against the seat. The valve is available in ⅜, ½, ¾ and 1 in. models with various voltage capacities. Minneapolis-Honeywell Regulator Co., 2641 4th Ave., S., Minneapolis 8.

Flexible Oil Burner

Designed to operate at 0.65 to 3.5 gph, a new oil burner consists of one basic unit adaptable to many uses through change of nose pieces, nozzles and manifolds, according to the manufacturer.

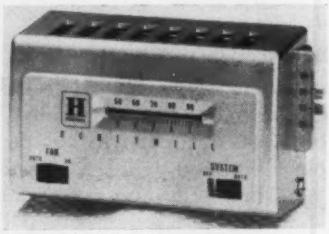
In addition to its use for conversion, the unit is flexible for use in primary heating units, the company says. Century Engineering Corp., 401-431 3rd St., S.E., Cedar Rapids, Iowa.

Welding Gun for Plastics

A lightweight, electric hot gas welding gun for plastics of the thermoplastic group operates on 110 volts with a choice of 180, 240 or 320 watt elements, the company announces. While the welding medium usually is electrically heated compressed air, for some purposes nitrogen or carbon dioxide may be used, says the company. A valve controls the temperature.

Swiss made, the welding gun is being marketed in this country by the Seelye Craftsmen Industrial Plastics Div., 984 Central Ave., Minneapolis.

Thermostat



A new double duty thermostat, designed to select either heating or cooling and a compact panel containing all of the circuitry needed for either add-on or combination heating-cooling units, facilitates automatic change-over according to temperature changes, states the manufacturer.

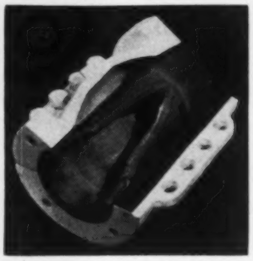
The model "T833B," shown, provides for complete shutoff of the system, the company says. Another, the "T833C," permits shutoff of the cooling system only. Minneapolis-Honeywell Regulator Co., 2641 4th Ave., S., Minneapolis 8.

Electric Scale Control

Recent design improvements have been incorporated in all five sizes, ranging from ¾ to 4 in., of the manufacturer's electric scale control unit, the company reports. The control is designed to treat water electrically for the prevention of hard scale formation in systems which use or are cooled with water.

A new method of applying the electrical treatment has been developed in the cylinder, the number of required connections is reduced from 4 to 2, and changes have been made in the control box for operating efficiency, according to the manufacturer. Aqua Electric Scale Control, Inc., 2028 E. 22nd St., Cleveland 15.

New Control Valve



For controlling pipe lines, the new "Red Jacket" valve is designed primarily for service with solids in suspension such as coal slurry, paper pulp, sand, etc., but may also be used for water, oil and gas applications, its manufacturer reports.

The valve operates by air or hydraulic pressure compressing the rubber sleeve. As the pressure in the annular space between the valve body and sleeve varies, so does the valve opening, according to the company.

Cast iron and steel bodies are suitable for pressures to 150 and 600 psig, respectively, says the manufacturer, and standard sleeves of reinforced gum rubber will withstand temperatures to 180 F. Red Jacket Co., Inc., 510 Investment Bldg., Pittsburgh 22.

Fuel Oil Additive

Formulated to dissolve sludge, disperse water and prevent rust, "Sludge

(Continued on page 240)

How Nabisco exhausts heat from giant cookie ovens

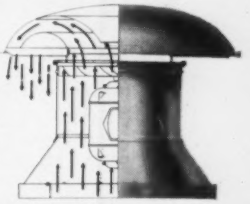
At Portland, Oregon, the modern National Biscuit Company plant is one of the most scientifically equipped food producing establishments in the world. But you can imagine how hot it could get around ovens that turn out several million cookies a day!

Plant designers Ford, Bacon and Davis anticipated the need for exhausting hot air caused by baking processes, and came up with the right recipe. 42 DeBothezat Power-Flow Roof Ventilators, each with 21″ fan wheel and 1 HP totally enclosed air-over motor, were installed on the roof directly over the oven area. 19 Power-Flows with 27″ fan wheel and 1 HP motor were installed on the roof above the packaging and shipping areas. Altogether these 61 Power-Flow Roof Ventilators exhaust more than 445,000 cubic feet of air per minute. Controlled ventilation assures good working conditions, and is in keeping with the high standards of Nabisco operation and sanitation.

STREAMLINED DESIGN . . . CERTIFIED RATINGS

DeBothezat Power-Flow Roof Ventilator is a motor-driven fan in a weather-proof housing, for use with or without duct systems, either for air exhaust or intake.

Power-Flows are available with fan wheels 12″ through 48″ in diameter, delivering up to 40,900 C.F.M. Their low, streamlined design blends well with all architecture. Performance ratings of Power-Flow Roof Ventilators are certified to be in accordance with standards of ASHVE, NAFM, PFMA and U. S. Dept. of Commerce. For catalog containing illustrations, specifications and certified capacity ratings, mail coupon below.



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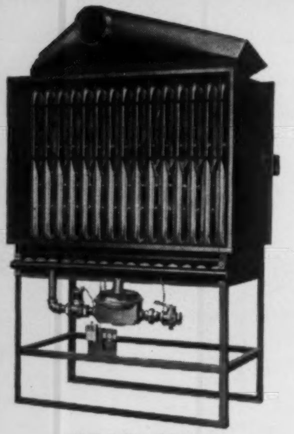
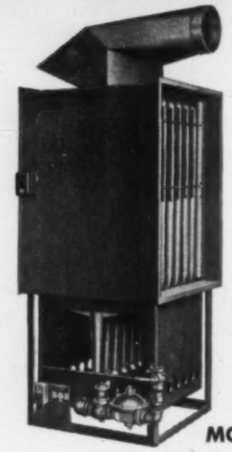
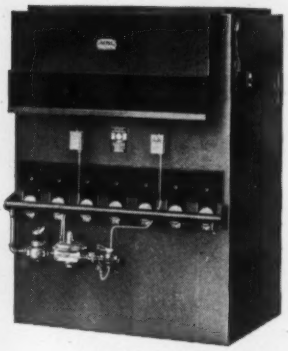


MODEL SED-E



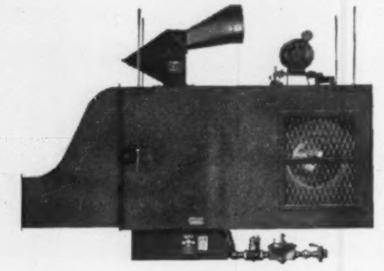
MODEL SED-S



MODEL SED-VF

MODEL SED-E — Non-corrosive type 321 stainless steel heat exchanger. Permits installation downstream of cooling equipment, for continuous blower operation. Air throughput in either direction. 80,000 to 600,000 Btu input.

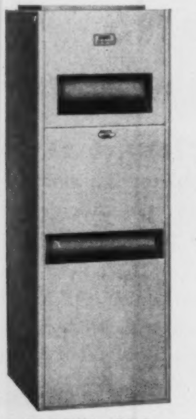
MODEL SED-S — Same as SED-E except controls are at the side, instead of at the end where accessibility requires either SED-E or SED-S is available in sizes from 80,000 to 600,000 Btu input in increments of 40,000 Btu.



MODEL SEU

MODEL SED-VF — Tested and approved as a duct furnace; type 321 stainless steel. Re-circulated or fresh air enters through bottom, sides, or back. Built-in air bypass, vent in front. Sizes from 70,000 to 245,000 Btu input.

MODEL SEU — Suspended unit heater. Recirculates room air. Diffuser outlet with adjustable vertical and horizontal vanes. Double inlet forward curve blower. Continuous duty, variable pitch drives, raised port burners. 80,000 to 600,000 Btu input.



MODEL SEC

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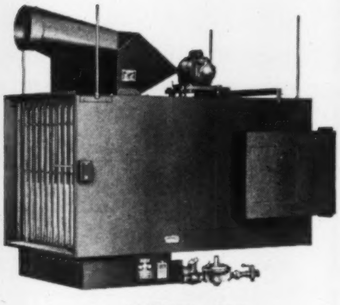


MODEL SES

MODEL SEC — Forced air furnace. Stainless steel heat exchanger sections seam and arc welded. One piece cast iron burners with drilled ports. Oversize double inlet blower, glass or washable filters. 6 sizes — 70,000 to 245,000 Btu input. For zero clearance.

REPRESENTATIVES

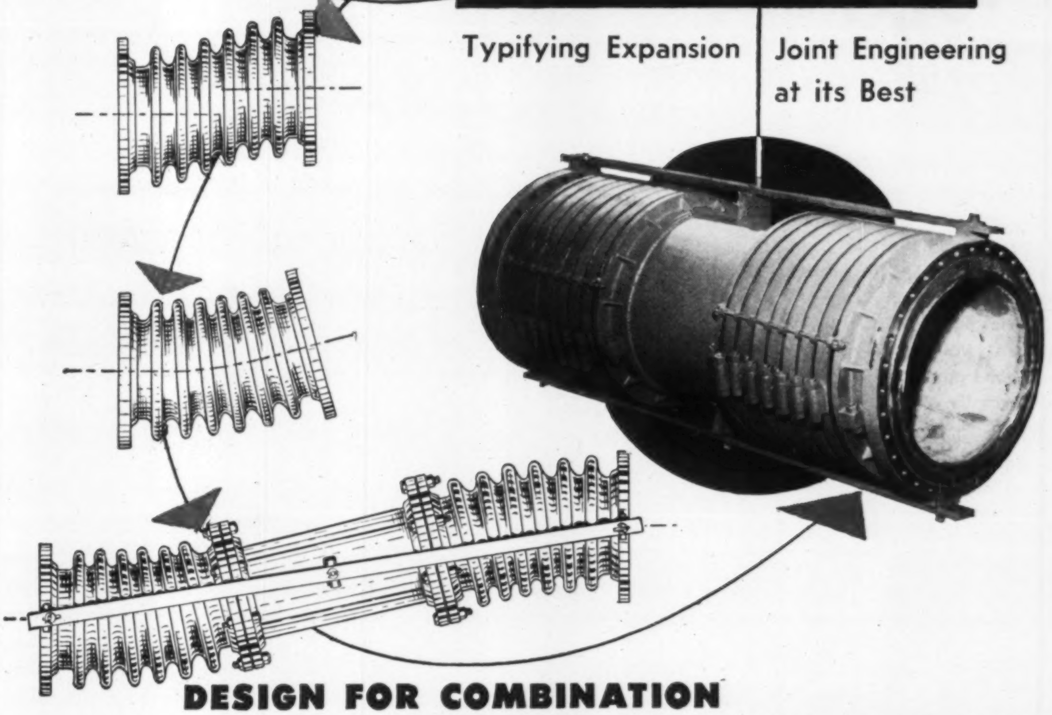
M. Blazer & Son, Passaic, New Jersey.
Blue Flame Supply Company, Atlanta, Georgia
Eugene Bolstad, Edmonton, Alberta, Canada.
E. B. Bomar, Phoenix, Arizona.
Boyd Engineering Co., Albuquerque, New Mexico
And El Paso, Texas.
Reube O. Emery, Nashville, Tennessee.
F & D Distributors, Salt Lake City, Utah.
Leudecke Engineering Co., Austin, Texas.
McCombs Supply Co., Denver, Colorado.
O'Connor-Oklahoma Co., Oklahoma City,
Tulsa, Oklahoma & Wichita, Kas.
Smith Steam Specialty Co., Kansas City, Mo.
Tay-Holbrook, Inc., San Francisco, California.
F. R. Young, Houston, Texas.
Associated Refrigeration Engineers, Montgomery, Alabama.
Dealers Supply Company, Atlanta, Georgia.
Jewell & Company, Hot Springs, Arkansas.
Homer Maxey & Company, Lubbock, Texas.
Noland & Co., Newport News, Va.

MODEL SES—Forced air, suspended furnace for installation in suspended duct system. Inlet and outlet designed for sheet metal duct connection. Double inlet forward curved blower. Continuous duty variable pitch drives, raised port burners.

Badger

EXPANSION JOINTS

Typifying Expansion Joint Engineering at its Best



DESIGN FOR COMBINATION LINEAR-SHEAR-LATERAL MOVEMENTS

Study these sketches showing (somewhat exaggerated, of course) several of the more complex movements to which expansion joints are often subjected. Do you have such pipe line conditions? Do you have any installation coming up that might involve such movements?

Here's the Badger Joint that is designed for just such a problem: the TANDEM JOINT. It's available in both Self-Equalizing and Non-Equalizing design. The joint movement is controlled by the tandem bars pivoting on a pin in the connecting nipple. Permissible shear or lateral movement depends upon the overall length as well as the number of corrugations in each unit. Each tandem unit is designed to suit the individual job requirements.

The Tandem Joint is but one of several special types designed for complex pipe line movements. We'll be glad to study your problem and make recommendations. Should yours be a straight linear traverse—as most installations are—we have a wide range in Directed Flexing, Self-Equalizing and Non-Equalizing Joints made of copper or stainless steel, with flanged or welding ends.

Badger Expansion Joints come in a variety of types and a wide range of sizes: Directed Flexing, Self-Equalizing for longer traverses and higher pressure; Non-Equalizing, for shorter traverse or when pressures are low. Tandem Joints for combination axial and lateral movements; Clevis Joints for angular rotation.

Special Vibration Control Joints; Flexible Pipe Line Seals for watertight connection between pipe and flood walls.

BADGER MANUFACTURING COMPANY

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heads from 6 feet to 650 FEET

there's a space-saving

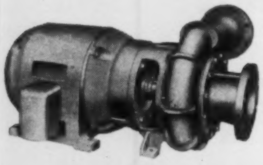
MOTORPUMP

that's right for the job!

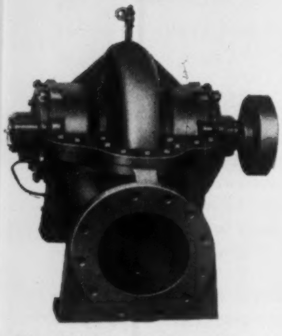
Height is no object. Neither is capacity or horsepower rating. For practically all normal air conditioning requirements (and many abnormal ones, too) are easily met by the newly expanded MOTORPUMP line. With over 200 standard models, covering capacities from 5 to 2800 gpm and heads to 650 ft., your local I-R representative is in a good position to solve not just a few, but virtually *all* of your liquid-moving problems.

This *one source* means faster, better service on all orders . . . simplified servicing and stocking, too. No matter how you look at it—dependability, versatility, availability—Ingersoll-Rand MOTORPUMPS are your best buy.

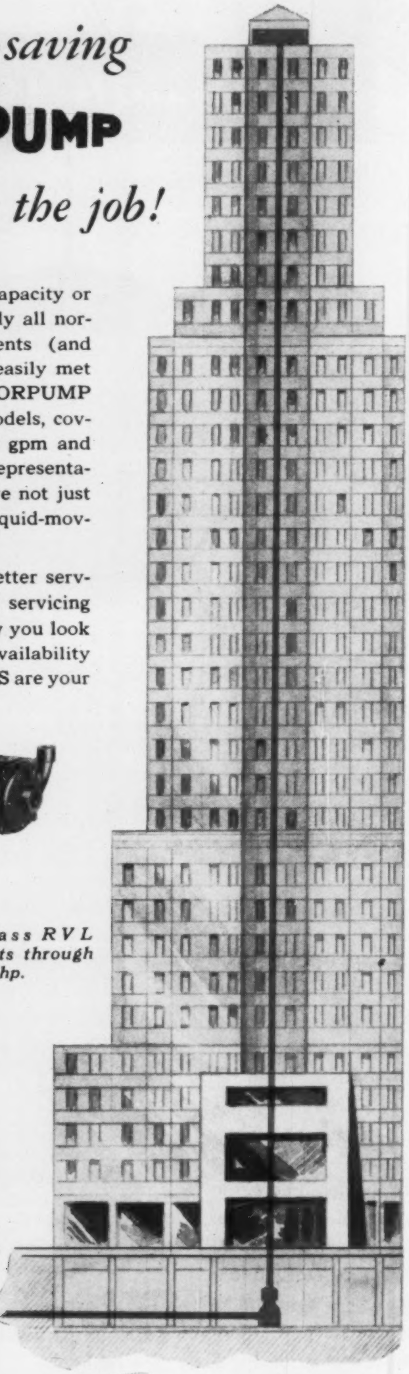
Class KRVS units 1/3 through 7 1/2 hp.



Class RVL units through 75 hp.



Class DMV units through 150 hp.



Ingersoll-Rand

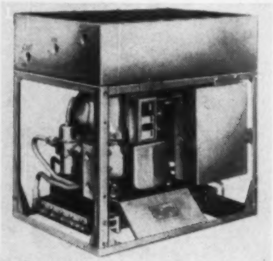
9-167 11 Broadway, New York 4, N. Y.

EQUIPMENT DEVELOPMENTS

From p. 236

Solvent No. 32" also emulsifies water which gets into the oil by condensation and by accident, the company reports. The emulsifiers promote wetting of the inside of the tank by oil rather than water—thus keeping water away and so preventing rust, according to the manufacturer. Montgomery Chemical Co., Jenkintown, Pa.

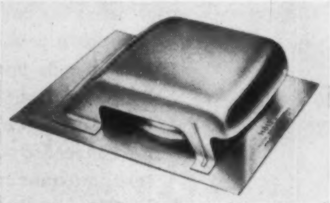
Liquid Chiller



Equipped with either air or water cooled condensers, liquid chiller units are manufactured in 2 and 3 hp sizes with all components assembled within a steel frame, the company reports. Units are equipped with devices to protect them against freezeup of the evaporators and overpressures, and to protect the motors against overloads, according to the manufacturer.

Chillers are furnished for 220 volt, 60 cycle, single or three phase operation. Cool-Ette, Inc., 20080 James Couzens Hwy., Detroit 35.

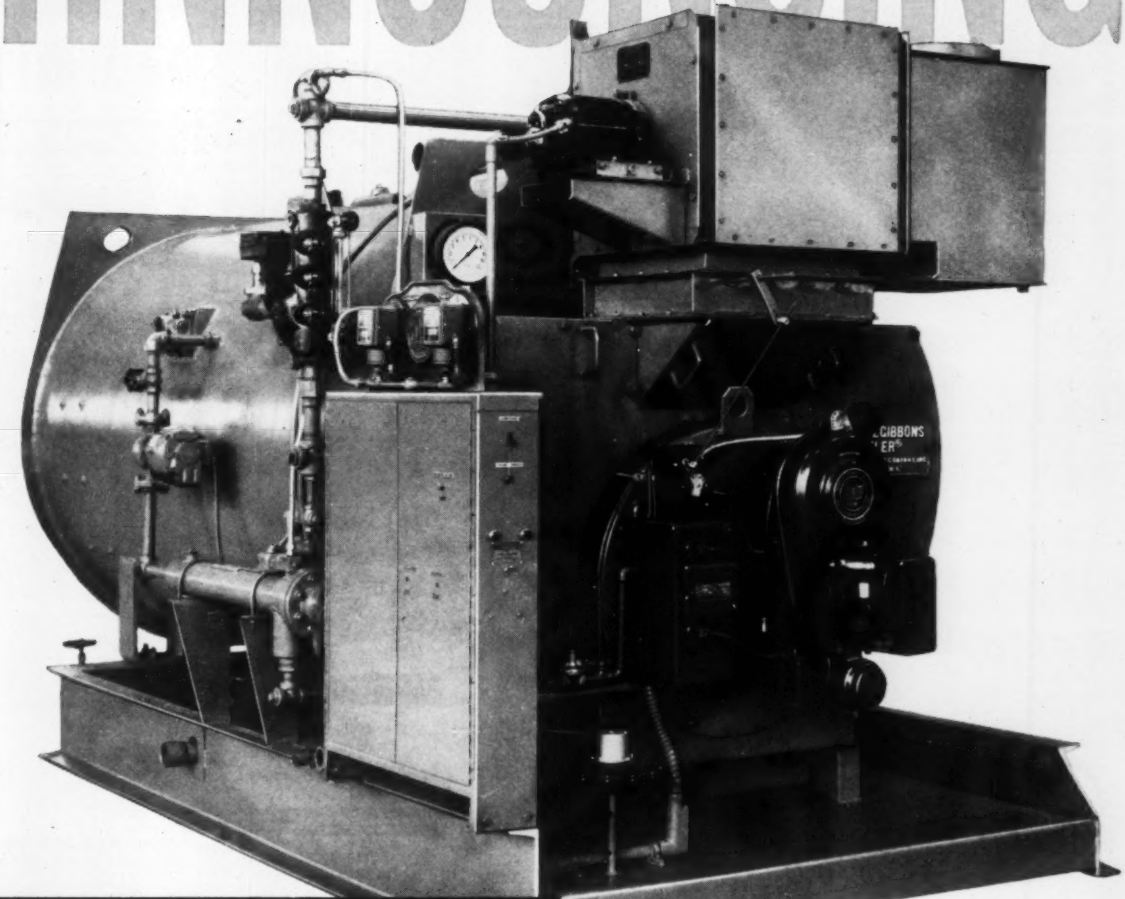
Roof Ventilators



The manufacturer's new roof ventilator has a top formed from a single piece of metal, styled to give a low silhouette. The model has a one piece base without joints designed to prevent leakage and for ease in installation. Units are made in two sizes and are available in galvanized metal or

ANNOUNCING

FITZGIBBONS *Packaged* BOILER UNIT



A coordinated, complete low pressure heating package fire-tested and shipped as a unit!

REAR FURNACE WALLS COMPLETELY WATER JACKETED NO REAR WALL REFRACTORY NEEDED

- Induced draft for cleaner, quieter operation.
- Fully automatic for oil, gas or combination.
- 80% efficiency certified at gross output.
- Compact – Minimum clearance only needed at rear and one side.
- Rated on basis of 8.2 sq. ft. heating surface per boiler hp. with guaranteed gross output based on 5.0 sq. ft. heating surface per boiler hp.

Catalog FPB-10 gives complete details.
Address Fitzgibbons Boiler Company, Inc.,
101 Park Avenue, New York 17, N. Y.

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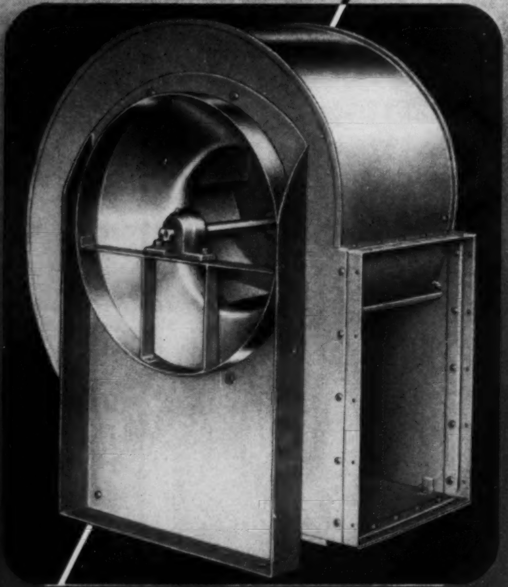
FANS



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Certified ratings are the result of tests made by the Manufacturer in accordance with the Standard Test Code for Centrifugal, Axial, and Propeller Fans adopted jointly by the National Association of Fan Manufacturers and the American Society of Heating and Ventilating Engineers.
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- DEPENDABLE
- CERTIFIED RATINGS

You will find that ALADDIN Fans are available in many types . . . each ruggedly built and fully equal to the job for which it is intended. Thousands of ALADDIN Fans are now in service meeting the air-handling requirements of every essential industry, from chemical to aircraft, on farms and aboard ships.

More and more architects and engineers have come to know ALADDIN Fans . . . and to recognize their merits of quality and dependability.

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ARMORED BUSHED CABLE AND THERMOSTAT CABLE (UL APPROVED)

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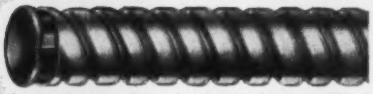

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Rugged Plasticord and Plasticote CHESTER coatings are extra smooth, extra pliable — easier to work with. They're longer lasting, too, because CHESTER ruggedized plastic coatings offer the maximum in resistance to oil, grease, water, dirt and grime. For easier wiring, better wiring — choose CHESTER. All constructions built to exceed service requirements.

"*Chesty*" says — For dependable wiring — consult the Chester catalog. Write for your copy, today!

CHESTER CABLE CORP.
CHESTER, NEW YORK

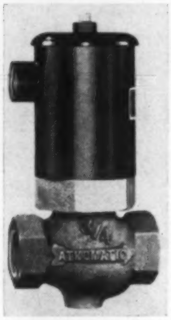
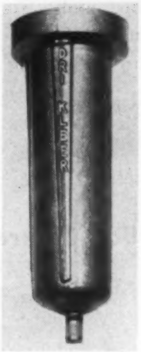
EQUIPMENT DEVELOPMENTS
Continued

aluminum, the company says. Lehigh Building Products Div., Air Control Products, Inc., Coopersville, Mich.

Air Filter for Piping

"Dri-Kleer," a new mechanical air filter is the newest addition to the company's line of porous fluorocarbon plastic filter media and filters. A chemically inert and water repellent "Teflon" felt core operates as the "heart" of the unit, the manufacturer reports. This water repellency prevents the accumulation of water, thereby keeping air flow rates high, says the company.

Filters are rated at 20 cfm flow rates, at a maximum operating pressure of 125 psi. Pipe size connections are 1/4 in. IPS. Porous Plastic Filter Co., 30 Sea Cliff Ave., Glen Cove, N.Y.

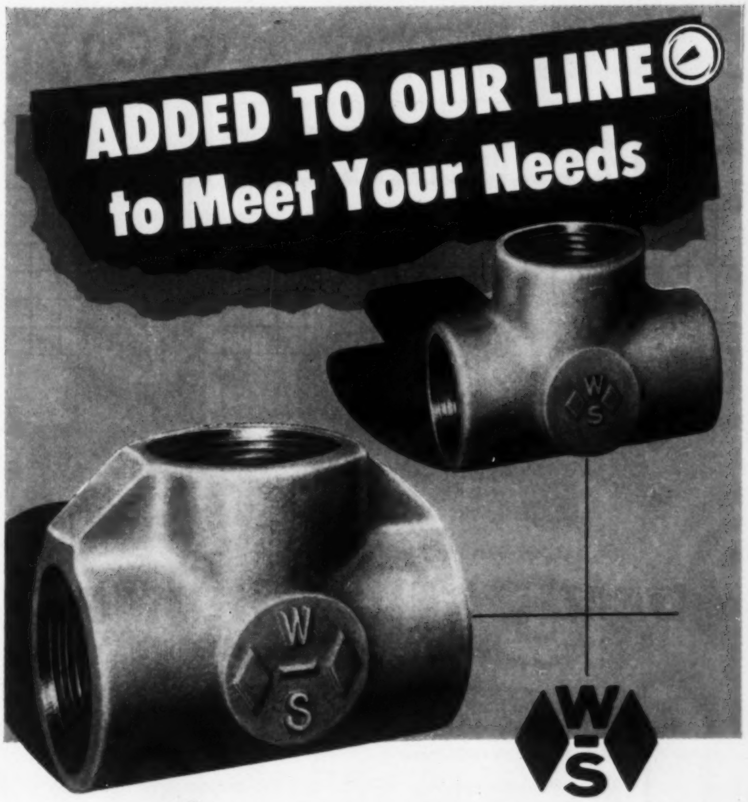
Above: Solenoid Valve
Right: Air Filter

Solenoid Valve

The manufacturer's solenoid valve for use with air, gas, "Freon," methyl chloride, water, oil, low pressure steam, etc., operates as follows, the company reports:

When the solenoid is energized, the coil lifts the pilot valve assembly from the pilot valve orifice, thus relieving the pressure on the top of the piston. Line pressure then lifts the piston. When there is no pressure, the pilot valve assembly engages the piston directly, lifting it from the full port area.

Valves are designed to fit 1/2, 3/4 and 1 in. pipe sizes and operate under pressures from 150 down to 0 psi at temperatures to 250 F. Atkomatic Valve Co., 545 Abbott St., Indianapolis.



New WATSON-STILLMAN
150 LB. STAINLESS STEEL
PIPE FITTINGS, *Types 304, 316*

Now you can get performance-proved Watson-Stillman Fittings for standard pressure services that need the corrosion resistance, heat resistance and low temperature toughness of 18-8 Stainless Steel.

W-S 150 lb. Stainless Fittings, rated at 400 psi cold non-shock working pressure and 150 psi steam pressure, are ideal for process piping, refrigeration systems, high temperature liquid and gas piping and other piping systems. They are available in both Screw-End and Socket-Welding Types in sizes ⅛" to 2".

The new Watson-Stillman Stainless Steel Fittings will assure you of long, trouble-free service in tough piping applications . . . will reduce down-time and cut maintenance costs. For full technical information on these fittings write today for Bulletin S-3-55.

WATSON-STILLMAN
150 lb.
Stainless
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Sold Through Leading Distributors

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HKP H. K. PORTER COMPANY, INC.
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10

ECONOMICAL

DEMING MOTOR MOUNT PUMPS

These general purpose pumps are compact, dependable units designed for ready adaptability to individual requirements. Note a few of their many advantages:

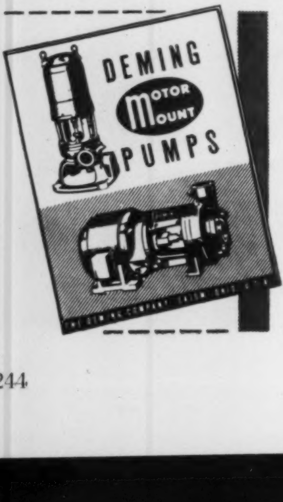
1. All units are designed for use with standard motors having NEMA type "C" mounting flange. A special shaft extension is not required.
2. A collet type coupling (same as used on machine tools) connects pump shaft and motor shaft into one rigid unit, running absolutely true.
3. Pumps can be furnished with either standard stuffing box or with mechanical seal.
4. Impeller is enclosed type with non-overloading characteristics, and locked to the shaft by a key and tapered mounting.
5. The pump shaft is solid stainless steel and easily replaceable.
6. The vertical units can be completely serviced without disconnecting suction or discharge piping.

* * * *

The complete line includes Type "H" (Horizontal) and Type "V" (Vertical), as illustrated. Capacities range up to 200 g.p.m., heads up to 165 ft. Motors from ¼ H.P. to 7½ H.P. Speeds 1750 and 3500 rpm. Maximum total pressure 125 lbs. Maximum suction pressure 50 lbs. Maximum recommended temperature of liquid being pumped is 220°F.

For complete details including all construction features, metal specifications and selection tables of Deming MOTOR-MOUNT Centrifugal Pumps, send for BULLETIN No. 4350.

To save your time, use the convenient form below.



THE DEMING COMPANY

560 Broadway, Salem, Ohio

Please mail free copy of your BULLETIN NO. 4350 which describes Deming MOTOR-MOUNT PUMPS.

Name ______________________

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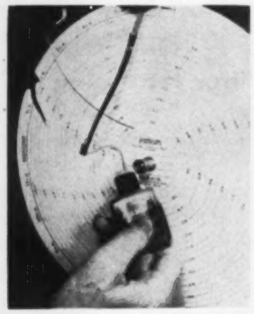
Address ______________________

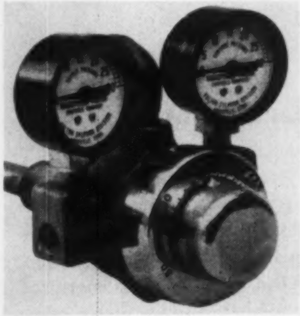
Recorder Ink



A new general purpose ink, type "1500," has been developed for use with the company's line of industrial recording instruments. According to the manufacturer, the ink contains no sediment, is smooth flowing, will not clog the pen, and dries quickly without feathering the chart.

It has a wide range of performance under varying industrial conditions, is rated for high temperature and can be used down to zero F, the company continues. For convenience in inking the pen, ink is furnished in a 1 oz polyethylene squeeze bottle. Foxboro Co., Foxboro, Mass.

Pilot Controller



A new thermostatic pilot controller, designed to be small in size and rugged in construction, provides temperature control of liquids or air when employed with valves, dampers, and other controls, its manufacturer states. Units are designed for installation in control systems of instantaneous water heaters, chemical vats and processes, and other applications in which rapid response and adjustable control characteristics are required, according to the company.

In all types of building and industrial applications...

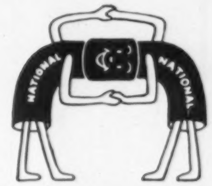
NATIONAL PIPE IS CHOSEN CONSISTENTLY *because*—

NATIONAL
NATIONAL
NATIONAL

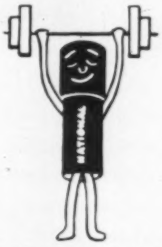
It's uniform throughout—National Pipe is uniform in metallic structure, ductility, strength, corrosion resistance, surface finish and diameter.

It threads and cuts easily—Absence of slag inclusions, laminations and blisters assures smooth, strong threads . . . clean cuts.

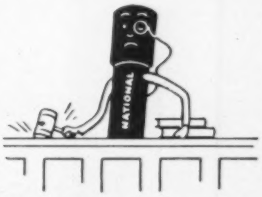
It coils and bends well—National Pipe has that extra strength and ductility so necessary to meet the demands for smooth, uniform coils and bends.



It makes sound joints—Uniformity and accuracy in manufacturing have made unequalled pipe jointing records for National Pipe . . . whether welded or threaded.



It's strong—Close metallurgical control of chemical and physical properties gives National Steel Pipe "built-in" strength.



It's rigidly controlled—From the raw material to the finished product, one organization has rigid control over the manufacturing steps that produce National Steel Pipe.

It's thoroughly tested—Each and every stage of production is carefully checked by the finest instruments . . . the most experienced men.

It's constantly improved—For over 60 years, National Steel Pipe has constantly been improved to meet the most difficult requirements.

It's gained nationwide acceptance—A cross section of industrial or building applications will show a predominant use of National Pipe . . . largest selling pipe in the world.

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COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

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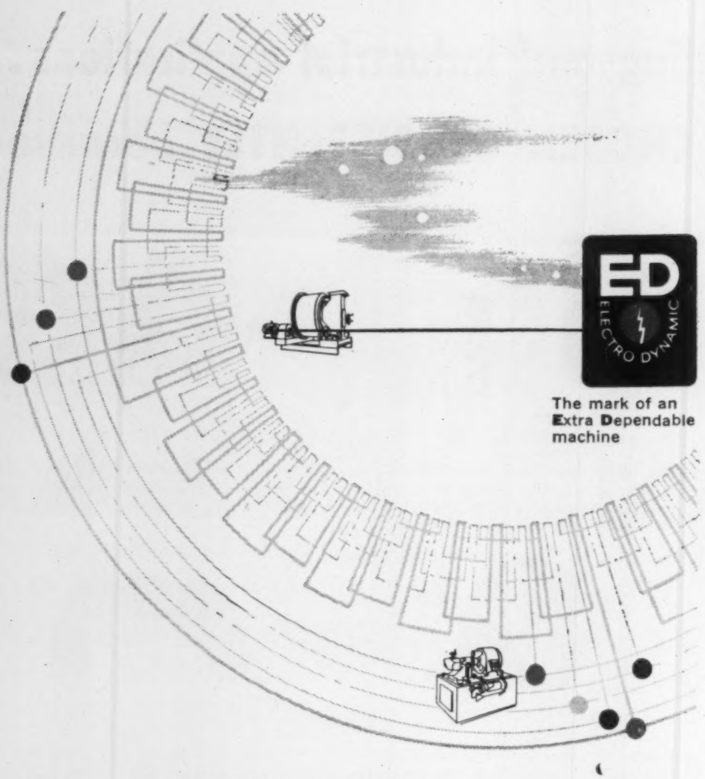
UNITED STATES STEEL

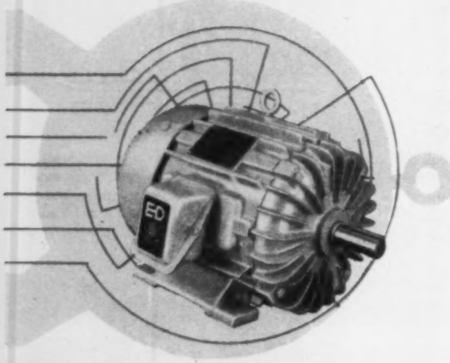


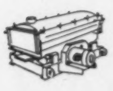
The mark of an **E**xtra **D**ependable machine

a better kind of power

FOR INDUSTRIAL MACHINES

Extra starting and anti-stalling capacity: Extra cool, extra quiet operation: Achieved without sacrifice of full-load efficiency. Backed by unparalleled experience, E.D. motors are *extra dependable*—75 years in the making—yours today *at no extra cost!*





1 to 250 hp. AC and DC.
N.E.M.A. standards.

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Dependable motors

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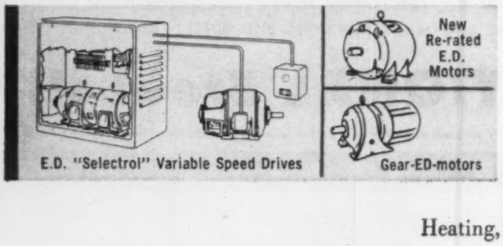
Write for Brochure 100 and literature on new E.D. motors and drives.



Electro Dynamic division of General Dynamics Corporation Bayonne, New Jersey

EQUIPMENT DEVELOPMENTS

Continued

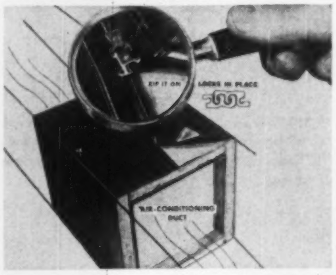
They will control temperatures in wide adjustable ranges from 50 to 250 F and from 150 to 350 F, the manufacturer says. Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Box 400, Knoxville 1.

Window Air Filter

A feature of the manufacturer's "Therm-Aire" electric window air filter with thermostatic heater coil is the arrangement by which the heater coil is turned on and off at varying intervals, depending upon changes in outdoor and room temperature, radiator heat, and air volume, the company says. In warm weather the unit may be used also for bringing in the cool night air and recirculating it, according to the manufacturer.

Units are provided with an extra filter containing activated charcoal, used in removing noxious gases as in smog. Air-Net Appliance Corp. 1340 E. 55th St., Chicago 15.

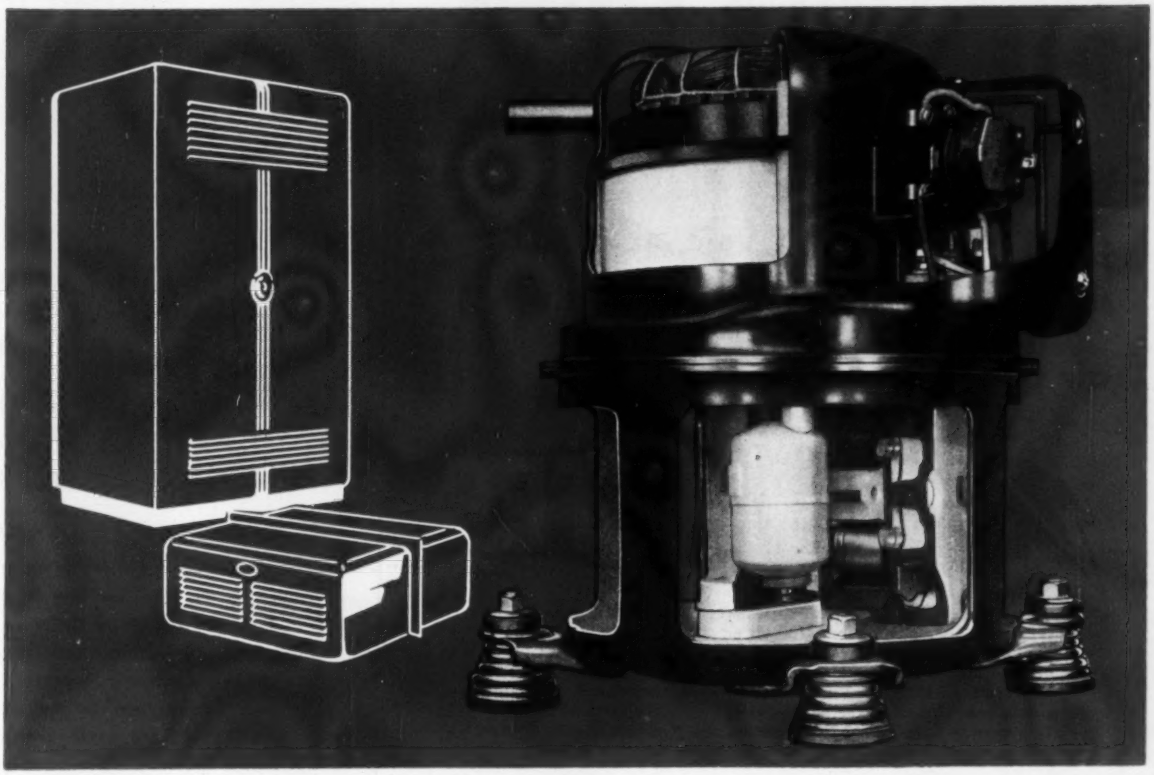
Duct Covering Finish



A new application for the manufacturer's "Protektinsul" fabricated, poly-vinyl chloride outer finish is as a protective covering for insulation aginst weather, abrasion, chemicals, etc., the company announces. The covering, furnished to size, zips on and locks in place, requiring no cutting, fitting or sewing, according

WHISPER-QUIET **POWER**

for package Air Conditioning



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It takes real engineering (and knowledge of your customers' needs) to produce a welded motor-compressor that combines positive performance, vibration-free smoothness, and maximum operating economy.

Copeland gives you these design advantages and more . . . plus precision manufacture using finest components. Heavy-duty, high-power-factor motor delivers power aplenty with minimum current consumption. Freon-12 and Freon-22 models available. Use of Freon-12 can give you as much as 75°F. lower temperatures in windings, crankcase, oil and discharge side. Unusually high capacities make Copelaweld motor-compressors adaptable to virtually every type of duty.

Power all your air conditioning and refrigeration equipment with Copeland motor-compressors. It's *the* quality equipment that enhances your reputation by its long-run, trouble-free service.

Get full details . . . write today for complete information on the profit-making Copeland line.

REFRIGERATION UNITS (OPEN TYPE AND COPELAMETIC) WATER COOLERS

Copeland

DEPENDABLE [illegible] REFRIGERATION

COPELAND REFRIGERATION CORPORATION · SIDNEY, OHIO

Vilter installation in the Fifth Avenue Baptist Church, Huntington, West Va.

for *supreme comfort* in church air conditioning

√CHECK with VILTER

Last summer the largest church in West Virginia was also one of the coolest—thanks to modern Vilter air conditioning. Each summer Sunday over 1,000 people attending the Fifth Avenue Baptist Church of Huntington listened in comfort to the moving sermons of the Reverend J. Maurice Trimmer, Pastor of the church, who has conducted "church of the air" services over CBS national hook-up. In a note to Commercial Refrigeration, Inc.* of Huntington, Pastor Trimmer had this to say about the air conditioning system: "We are highly pleased with the installation of the air conditioning system in our church. It has proved to be most satisfactory and our people are thoroughly delighted with it."

The refrigeration equipment includes an 8-cylinder Vilter VMC condensing unit driven by a 75 h.p. part winding motor with increment starting. The cooling coils are direct expansion coils having a total face area of 24½ square feet. The refrigerant is supplied through four multiport thermostatic expansion valves. The air is moved by a blower designed for 14,400 c.f.m.

Now is the time to consider engineering and installing modern air conditioning in churches in your area . . . so they will be ready for summer services. You cannot go wrong in planning to use Vilter equipment in your installations. Vilter's complete line of air conditioning and refrigeration units known for their dependable, trouble-free operation . . . their long life . . . their efficient operation, are your guarantee of a top Quality system—one in which your customers will find real satisfaction.

***Sold and installed by Commercial Refrigeration, Inc., Vilter distributor in Huntington, West Virginia.**

Vilter®

Your nearby VILTER Representative or Distributor will be glad to show you how VILTER refrigeration can help you.

REFRIGERATION and AIR CONDITIONING

THE VILTER MANUFACTURING COMPANY, MILWAUKEE 7, WIS.

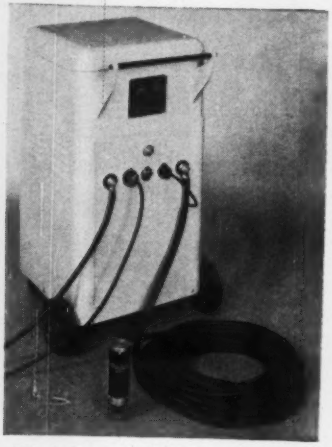
Air Units • Ammonia & Freon Compressors • Booster Compressors • Baudelot Coolers • Water and Brine Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pipe Coils • Valves & Fittings • Pakice and Polarflake Ice Machines

EQUIPMENT DEVELOPMENTS

Continued

to the manufacturer. Miracle Adhesives Corp., 214 E. 53rd St., New York 22.

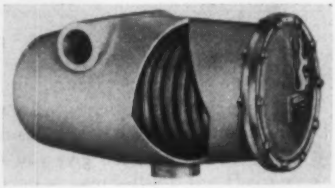
Welding Insulation Pins



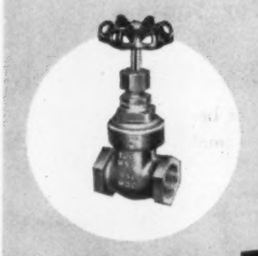
Used for attaching insulation pins to galvanized ductwork, the new model "Insul-Pin" welder features a cabinet in which space has been provided for the storage of the welding gun, ground cables and gun leads, the manufacturer reports.

The unit is designed to operate from a 110 volt, 60 cycle power supply and is not adversely affected by high or low line voltages within a range of 90 to 130 volts, according to the company. The model has a working range of a 100 ft diameter circle. Graham Mfg. Corp., 1541 E. Eight Mile Rd., Ferndale 20, Mich.

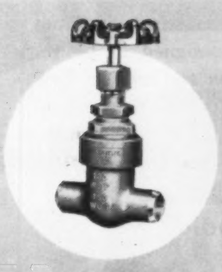
Tankless Water Heater



An improved model of the manufacturer's "T" series tankless water heater features a built in manual tempering valve, the company announces. The valve is adjusted for summer/winter control of hot water temperature and does not create a pressure unbalance which may be

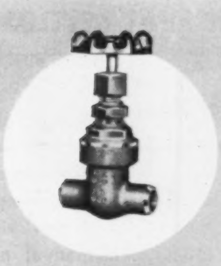


NO. 2500 GATE
100 Lbs. W.S.P.
150 Lbs. W.O.G.
Flexitite Disc
Sizes — ¼ through 3 inches
Also available with drain, sizes—½" through 2" (Fig. No. 2508)

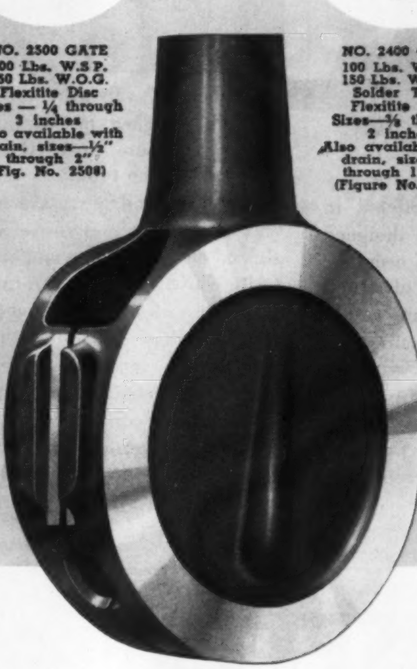


NO. 2400 GATE
100 Lbs. W.S.P.
150 Lbs. W.O.G.
Solder Type
Flexitite Disc
Sizes—⅜ through 2 inches
Also available with drain, sizes—⅜ through 1 inch (Figure No. 2408)

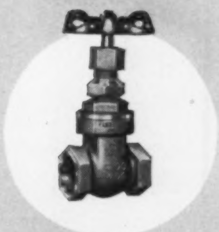
NO. 2000 GATE
125 Lbs. W.S.P.
200 Lbs. W.O.G.
Flexitite Disc
Sizes—⅛ through 3 inches



NO. 2800 GATE
125 Lbs. W.S.P.
200 Lbs. W.O.G.
Solder Type
Flexitite Disc
Sizes—⅜ through 3 inches



NO. 2100 GATE
Rising Stem
125 Lbs. W.S.P.
200 Lbs. W.O.G.
Flexitite Disc
Sizes—¼ through 3 inches



NO. 6500 GATE
125 Lbs. W.S.P.
200 Lbs. W.O.G.
Braze Type
Flexitite Disc
Ends Bored for Type-B Tubing
Sizes—½ through 3 inches

FLEXITITE means LEAKTIGHT

and every O-B Gate Valve has a Flexitite Disc®

The slot around the edge of the Flexitite Disc permits it to flex for adjustment to any slight misalignment in the valve seat. This flexing both reduces wear on disc and seat and works to assure a leaktight shutoff.

All O-B Gates feature the Flexitite Disc. Besides the 100 and 125-lb. (WSP) bronze valves shown here, O-B offers other gates at 150 and 200 pounds pressure. They are described fully in Bulletin 1323-V which is available on request. Or consult your O-B distributor who can tell you all about the Ohio Brass line of quality bronze valves, including gates, globes and checks and valves designed especially for air-conditioning installations.

Ohio Brass
MANSFIELD OB OHIO, U.S.A.

4570-V

noisy and difficult to control, according to the manufacturer.

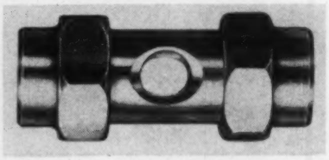
The valve is preset at the factory to give optimum performance under normal conditions, the company says, and where the bypass valve must be regulated, a manual adjustment may be made. Alstrom Corp., 790 E. 176th St., New York 60.

Spray Nozzle

A new spray nozzle, "Aspir-Jet," raises cooling tower efficiency by creating a swirling, atomizing action which increases water break-up and distribution, the company states.

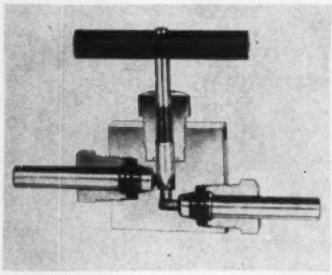
Nozzles are formed from butyrate plastic and are designed to be resistant to corrosion and erosion. Low pressures are required for operation, says the company. The nozzle is being distributed by The Thermal Agency, 1515 Dallas, Houston.

Liquid Eye Indicators



The company's "5000" series liquid eye indicators, now offered in ¾, 1 and 1¼ in. IPS, is designed using springs to force the neoprene gaskets in contact with the glass and steel housing. Fluid pressure within the end fittings aids in sealing the gasket joint against leaks, the manufacturer states. As a safety factor, extra strength "Pyrex" glass is used. The unit is designed for use with any of the "Freon" refrigerants and with ammonia. Allin Mfg. Co., 1153 W. Grand Ave., Chicago.

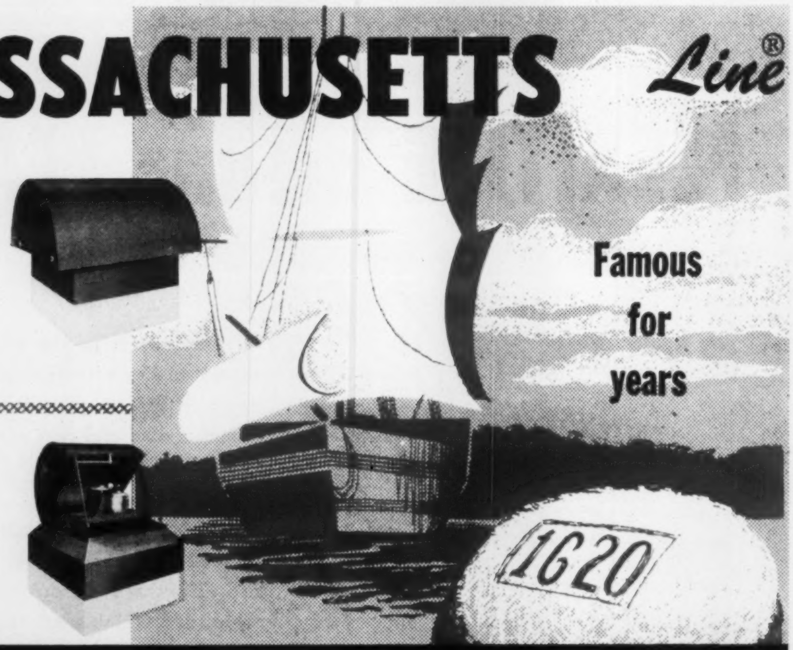
Valves for Tubing



"TubeLine" valves for use on tubing are designed to cut into lines faster and more easily than screw end valves. The tubing is cut to desired length and burrs are filed off. An adaptor nut and sleeve are then slipped onto the tubing and connected to the valve. This union forms a gas tight seal which is completed in much less time than is required to bevel and thread pipe for conventional valves, the manufacturer states.

Valves are available for four sizes of tubing ranging from 1/8 to 1/2 in. OD and 1/16 to 3/8 in. ID. Autoclave Engineers, Inc., 846 E. 19th St., Erie, Pa.

The MASSACHUSETTS *Line*®



MASSACHUSETTS POWER ROOF VENTILATORS . . .
Propeller Fan Type
Direct Driven 13 sizes 12 inch to 30 inch wheel diameter.
Belt Driven 11 sizes 24 inch to 48 inch diameter.
Write for Bulletin No. 119.

Power Fixed backward curve blade type.
Direct Driven 6 sizes 13 inch to 18 inch wheel diameter.
Belt Driven 23 sizes 15 inch to 60 inch wheel diameter.
Write for Bulletin No. 118.

MASSACHUSETTS BLOWER DIVISION
The BISHOP & BABCOCK *Mfg. Co.*
4901 HAMILTON AVENUE • CLEVELAND 14, OHIO

BRUNER
WATER SOFTENERS & FILTERS

for Industrial Installations

Hundreds of Bruner Industrial Water Softener installations are proving their superiority in military bases, industrial plants, hotels, hospitals, schools and colleges in all parts of the United States, Canada, Alaska and South America.

Examples of Bruner Industrial Installations:

SCHOOLS AND COLLEGES
- University of Wisconsin — Madison, Wis.
- University of Missouri — Columbia, Mo.
- Peabody High School — Trenton, Tenn.

HOTELS AND HOSPITALS
- Jung Hotel — New Orleans, La.
- Gulf Bay Hotel — Sarasota, Fla.
- Athens State Hospital — Athens, O.

INDUSTRIAL
- Chevrolet Division GM — Flint, Mich.
- Halle Bros. Dept. Store — Canton, O.
- Havana Laundry — Havana, Cuba
- General Electric Co. — Bloomington, Ind.

MILITARY
- Wright Patterson Air Force Base — Dayton, O.
- Big Spring Air Force Base — Big Spring, Tex.

There are Bruner Sales and Engineering offices in principal cities. Your inquiry will receive immediate attention.

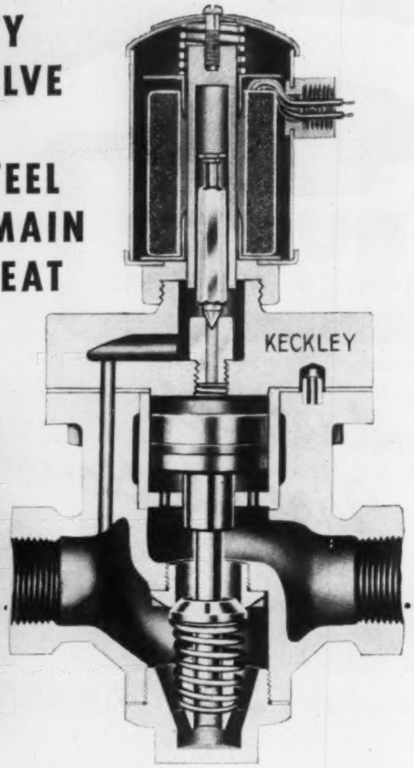
Manual and Fully Automatic softeners in capacities up to 1,500,000 grains are carried in stock. Larger capacities and special equipment to treat unusual water conditions engineered to meet your requirements.

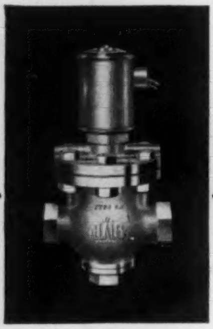
BRUNER
WATER SOFTENERS & FILTERS

BRUNER Corporation
4763 N. 32nd Street • Milwaukee 16, Wisconsin

Sales Offices in Principal Cities • Plants in Milwaukee and Santa Barbara

HEAVY DUTY SOLENOID VALVE WITH STAINLESS STEEL PILOT VALVE, MAIN VALVE AND SEAT





• The heavy duty pilot operated Type EA Keckley Solenoid Valve has many features not found in all solenoid valves. Simplicity of design has eliminated many wearing parts, and parts subject to wear are renewable. The piston is located above the flow eliminating any possibility of sediment scoring the cylinder liner. Valve body assembly is the same as Keckley Pressure Regulators of equal size—parts are interchangeable.

Incorporated into these valves are the best of materials and workmanship.

Order one for a test in your plant—no obligation. Write for details—Catalog 54-F.

SPECIFICATIONS

TYPE EA SOLENOID VALVES

Maximum Steam Pressure—250 lbs.
Maximum Air, Water, Oil and Gas Pressure—600 lbs.
Sizes ½" to 6" with Bronze or Semi-steel Bodies
Pilot Valve, Main Valve and Seat—Stainless Steel
Cylinder Wall—Bronze or Monel
Coils—Heavy Duty, Glass Insulated, Moisture Proof

O. C. KECKLEY COMPANY
400 W. MADISON ST.
CHICAGO 6, ILLINOIS

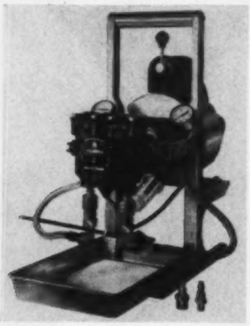
KECKLEY CHICAGO

Pressure Regulators • Temperature Regulators • Float Valves
Strainers • Solenoid Valves • Reducing Valves
Pop Safety Valves • Relief Valves

EQUIPMENT DEVELOPMENTS

Continued

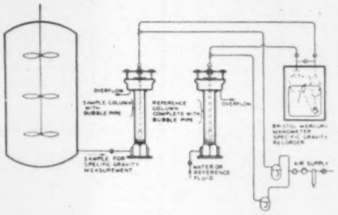
Fuel Unit Tester



A fuel unit tester that permits the operator to repair pumps, valves and fuel units, makes accurate tests of all makes of oil burner pumps, according to the manufacturer. As the model is portable, a fuel unit need not be taken to a service station, the company reports.

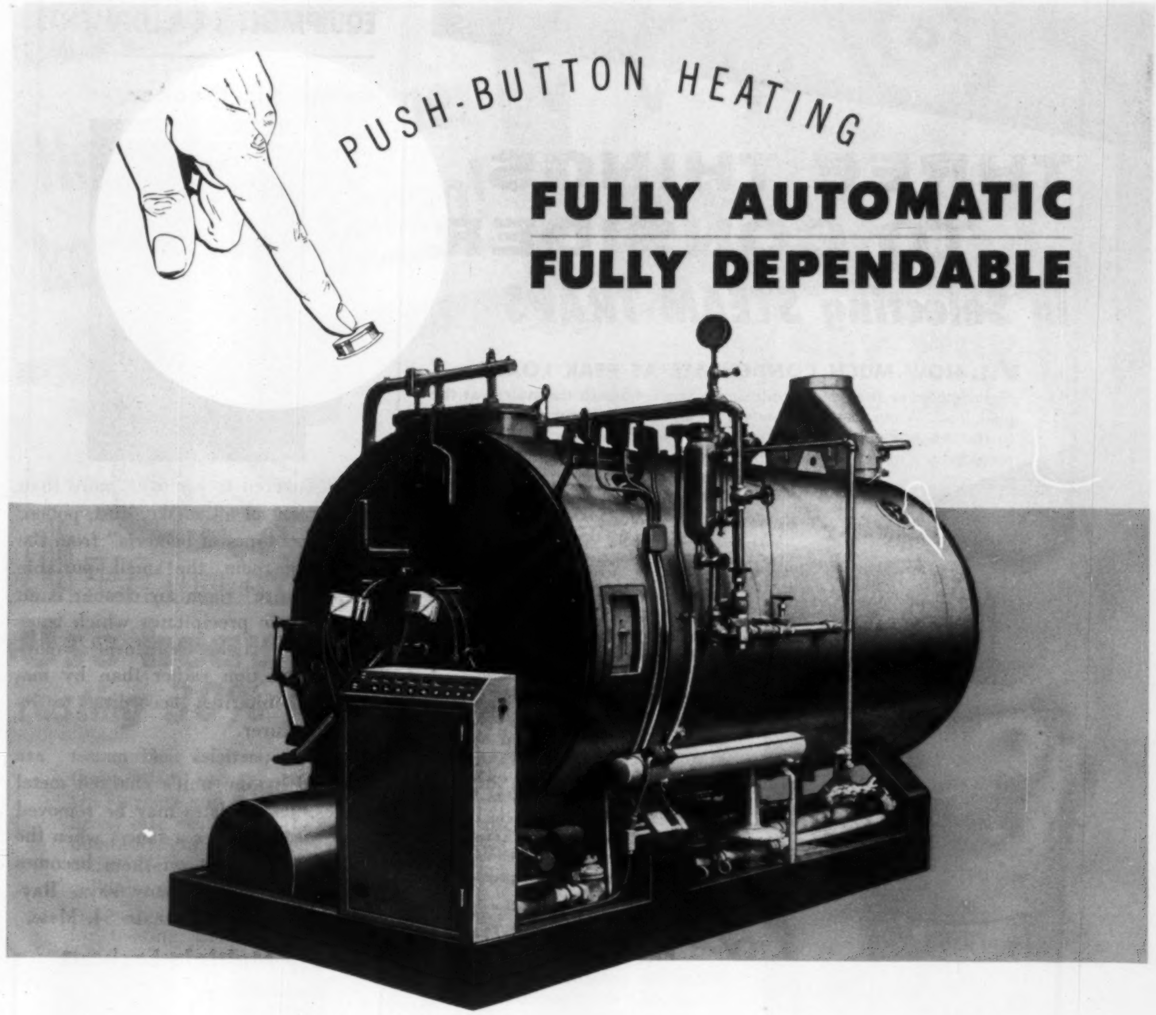
The tester is furnished with a pump flange, reversible 1/3 hp motor, U.S. gages, pressure fuel lines, quick coupling and adaptors. The Kingsley Mfg. Co., 420 Howard Ave., New Haven, Conn.

Specific Gravity Meters


OVERFLOW
SAMPLE COLUMN WITH BUBBLE PIPE
REFERENCE COLUMN COMPLETE WITH BUBBLE PIPE
OVERFLOW
BRISTOL MERCURY MANOMETER SPECIFIC GRAVITY RECORDER
SAMPLE FOR SPECIFIC GRAVITY MEASUREMENT
WATER OR REFERENCE FLUID
AIR SUPPLY

A new line of specific gravity meters for liquid solutions, mixtures and slurries operates by comparing the pressure necessary to displace a given head of the sample liquid in a bubbler pipe, with the pressure necessary to displace an equivalent head of water, the manufacturer reports.

The company also offers its "Electronic Dynamaster" recorder and controller in conjunction with radiation type density measuring units, for use in closed system measurements such as pipes, tanks or processing equipment. The Bristol Co., P.O. Box 1790, Waterbury 20, Conn.



FULLY AUTOMATIC
FULLY DEPENDABLE

Titusville TICOSTEAM

PACKAGE STEAM GENERATOR

Push-button controlled from a single station mounted integral with the boiler, every step in the operation of Titusville's TICOSTEAM Generator is automatic, simple, dependable and fully safeguarded. This modern, compact package steam generator is complete in every respect—finished, tested and certified at the factory, ready for your service. Operating with heavy or light oils, straight gas, or combination oil and gas, TICOSTEAM Generators are available in capacities from 2070 to 10,350 lbs. of steam per hour. Ask for descriptive Bulletin B-3100.

A Division of Struthers Wells

THE TITUSVILLE
IRON WORKS COMPANY
TITUSVILLE, PA.

Manufacturers of A Complete Line of Boilers for Every Heating and Power Requirement

✓ ✓ ✓

THREE THINGS TO CONSIDER

in Selecting STEAM TRAPS

✓ **1. HOW MUCH CONDENSATE AT PEAK LOAD?**

First determine how much condensate you'll have in the system at the peak load. When this is not known it can be easily figured by referring to the Anderson book "Solving Steam Trap Problems." However, to provide for a margin of safety the rating of the trap should be more than the condensate to be handled. The capacity rating factor should be at least two and sometimes as high as six, depending upon the steam condensing surface, the air to be vented as well as the type of trap used. By using Heat-Kwiks you never need a factor of more than 2 to 1. Therefore you get by with a smaller, less expensive unit.

✓ **2. HOW FAST MUST THE AIR BE VENTED?**

It is desirable to heat up cookers, kettles, dryers, laundry and dry cleaning equipment, etc., quickly in order to increase production. Whenever this condition exists select Heat-Kwik Steam Trap. This trap vents air 8 times faster. The added production soon pays for the cost of the trap.

✓ **3. WHAT IS THE STEAM PRESSURE VARIATION?**

When the pressure of a steam line drops off, the condensate-venting capacity of the conventional inverted bucket steam trap also falls off. Therefore if the pressure varies, choose a steam trap with a combination open float and bellows orifice . . . Heat-Kwik Steam Trap. The auxiliary bellows actuated orifice is unaffected by pressure.

Free!
36-page book "Solving Steam Trap Problems" shows how to select the right steam trap for any equipment. Write for your copy today.

The V. D. ANDERSON Company
Subsidiary of Chesapeake Industries, Inc.
1949 West 96th Street, Cleveland 2, Ohio

SUPER-SILVERTOP
HEAT-KWIKS
the __Engineered__ Steam Trap by
ANDERSON

EQUIPMENT DEVELOPMENTS

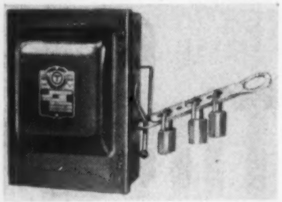
Continued

Room Air Cleaner

Engineered to remove "more than 99 percent of all smoke, dust, pollen, and some types of bacteria" from the air in a room, the small, portable "Micronaire" room air cleaner is an electrostatic precipitator which traps airborne particles by a form of magnetic attraction rather than by mechanical filtering, according to its manufacturer.

These particles of matter are trapped by the unit's charged metal plates. These plates may be removed and washed under a faucet when the collection of dust on them becomes too thick, the company says. Raytheon Mfg. Co., Waltham 54, Mass.

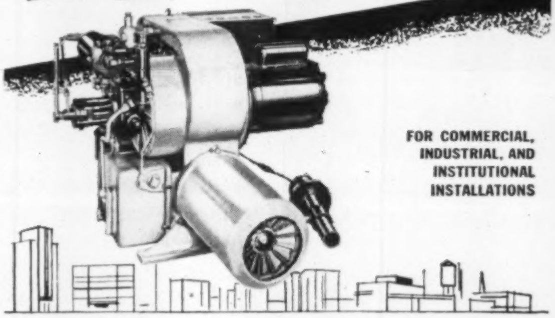
Safety Multiple Lockout



A new lockout device for electric switch and fuse boxes is used as a safety procedure when working on machines and equipment controlled by a common switch box, prevents others from throwing the switch not knowing that work is still being performed.

The company says the unit allows up to six padlocks so that, where a number of men are working on the operation, current may not be turned on until the last man has completed his work and removed his lock. Industrial Products Co., 2820 N. Fourth St., Philadelphia 33.

Hev-E-Oil Burner keeps heat cheap!


FOR COMMERCIAL, INDUSTRIAL, AND INSTITUTIONAL INSTALLATIONS

Use heavy fuel oils

costing 30% less per gallon

Cheap heat is smart economy! That's why thousands of owners are converting to Hev-E-Oil Burners and using *commercial* No. 4 or 5 heavy oils, costing 3 to 6¢ *less* per gallon than domestic light oils. Owners not only pocket the difference in cash, but get 7% more heat per gallon as well.

Hev-E-Oil Burners are specifically designed for heating buildings requiring more than 6,000 gallons of oil or 45 tons of coal per year. Conversion is simple. The Hev-E-Oil fits all types of standard heating boilers and changeover takes only a few hours' time. Reports on file show fuel savings pay for conversion in a season or two.

QUICK FACTS ON HEV-E-OIL BURNER

- Automatic, all-electric ignition
- Flame size set exactly to furnace capacity
- Low-pressure, air-atomizing, with large, non-clogging nozzle
- Six sizes: 1 to 60 gph
- Built-in low fire start
- As simple to install as a domestic burner
- Easy servicing and cleaning
- Air and oil metered to give high efficiency

If you own, specify, install or service burners, get all the facts about Hev-E-Oil Burner — a *quality* product of America's leading manufacturer of self-contained boilers and oil-fired equipment. Write for illustrated Bulletin AD-102 NOW. CLEAVER-BROOKS COMPANY, Dept. C-381 E. Keefe Ave., Milwaukee, Wis.

Hev E Oil
Cleaver-Brooks

Sales and Service In Principal Cities

Cleaver Brooks

HEV-E-OIL BURNERS ARE DESIGNED TO SAVE YOU MONEY

Any way you look at it...

Yes, look at this WEINMAN Pump *any* way you choose . . . from the standpoint of compact size . . . the way it mounts easily in any position to facilitate installation where space is limited . . .

. . . compare the matchless, long-lived efficiency and low unit cost . . . and you'll choose WEINMAN Centrifugal Pumps for all hot or chilled water circulating tasks.

When you choose WEINMAN Pumps, you benefit from over a full quarter-century of pump experience; you are assured of obtaining superior service and efficiency from your WEINMAN Centrifugal Pumps at no greater cost than ordinary pump units which offer far less. Get the expert advice of a WEINMAN Centrifugal Specialist when pump problems come up . . . he's the man that can help you solve your pump problems! Write, wire or phone today.

The WEINMAN Type AC close-coupled pump will give longer, thoroughly dependable service even when cooling water is loaded with abrasive grit . . . a rotary type mechanical seal, with a reversible ceramic floating seat and carbon washer combination held by a stainless steel spring, gives long leakproof operation. Rust and corrosion proof solid stainless steel shaft. For full details, ask for Bulletin 725.

Representatives in principal cities

Pioneer Centrifugal Specialists

The WEINMAN Pump Mfg. Co.

you save engineering time with complete hanger assemblies

To save many hours of engineering time and to speed up your specifications, use Blaw-Knox overhead roller assemblies, rigid hanger assemblies, functional spring hangers with the patented *internal swivel action*, constant support spring hangers and vibration eliminators.

Each is a complete unit, designed for a specific purpose. Constructed to comply with the "code for pressure piping." Available in types and sizes to meet varying conditions.

And each is ready to install, which eliminates expensive cutting, threading and assembling in the field.

Our experienced engineers are available to both design and make recommendations for your hanger requirements.

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1
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2
2000
3
3000
4
SPRING SIZE No 8
BLAW KNOX CO
POWER PIPING DIVISION
PIPE HANGERS
SUPPORTS
VIBRATION ELIMINATORS

Write for your copy of Bulletin No. 54 to get complete information

BLAW-KNOX COMPANY
Power Piping and Sprinkler Division
Pittsburgh 33, Pennsylvania

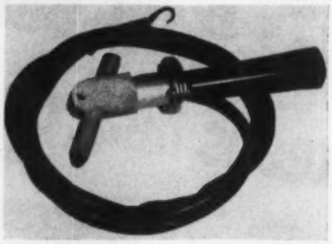
BLAW-KNOX PIPE HANGERS

Complete line of functional spring hangers • constant support spring hangers • rigid hanger assemblies • overhead roller assemblies • supports • vibration eliminators . . . plus complete prefabricated piping systems for all pressures and temperatures

EQUIPMENT DEVELOPMENTS

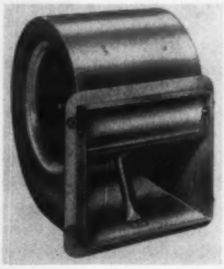
Continued

Soldering Unit Handpiece



A new handpiece for use with the manufacturer's "Glo-Melt" resistance soldering power units has a heat blocking fin arrangement incorporated with a split collet soldering tip holder, the company reports. This is designed to reduce the transfer of intense heat generated at the tip when soldering. Wassco Electric Products Corp., 126 W. Cass St., Joliet, Ill.

Direct Drive Blower



The manufacturer's new "Twin-Wheel" direct drive blower has a motor that is mounted in the center of the blower housing with two blower wheels mounted on extended shafts from each side of the motor, the company reports. This arrangement is designed to provide unobstructed air flow.

Center suspension of both motor and blower wheels facilitates well balanced loads on motor bearings by minimum overhang and good air flow cooling, according to the manufacturer. Air Controls, Inc., Div. of The Cleveland Heater Co., 2310 Superior Ave., Cleveland 14.

Deodorizer

A new fan operated "Air Freshener" is designed to neutralize unwanted odors in areas up to 7500 cu ft. The unit replaces these odors

Brunner makes only square pegs for square holes

. . . and round pegs for round holes, too! Brunner's wide range of air conditioning condensing units makes it possible for your customers to have the right type and size of units for their specific air conditioning requirements. They don't need to settle for something that's either too large or too small for the job.

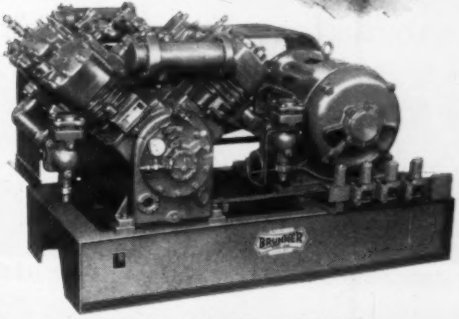
You can SELL BRUNNER with full confidence that your customers can buy the *right* unit for the *right* job.

"BRUNNER" MEANS BIGGER PROFITS FOR YOU

The completeness of the Brunner line opens the door to *bigger profits* for you. There are Brunner condensing units for every commercial and industrial application . . . large or small. They're noted for dependability . . . durability . . . easy installation and maintenance . . . and cost less to operate than many other units of similar capacities.

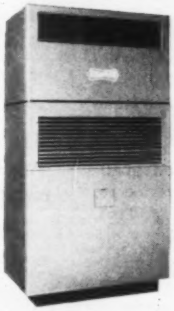
See your Brunner Representative, or write to:

BRUNNER MANUFACTURING COMPANY
Dept. L-355, Utica, N.Y.
The Brunner Co., Gainesville, Ga.
In Canada:
Brunner Corp. (Canada) Limited, Toronto, Ontario



▲ BRUNNER CONDENSING UNITS

. . . for remote air conditioning installation in commercial and industrial applications, are supplied in sizes up to 75 H.P. with capacity control. Brunner compressor units for use with evaporative condensers also available up to 75 H.P.



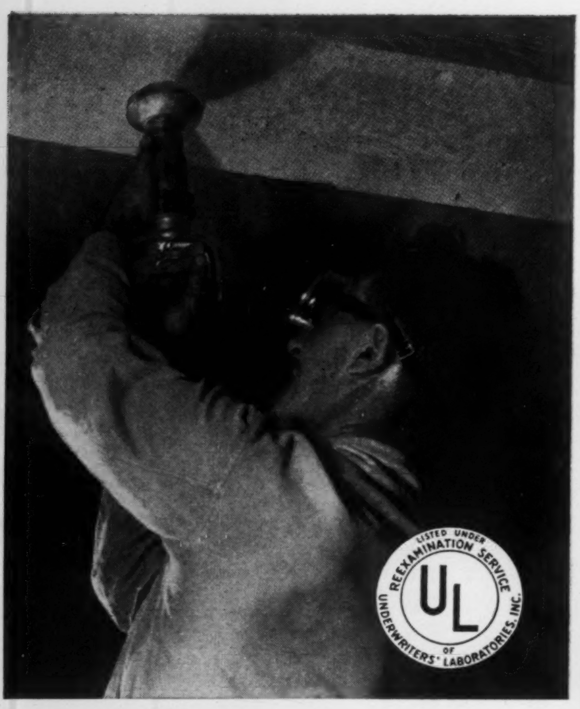
◀ BRUNNER PACKAGED AIR CONDITIONERS

. . . completely self-contained, are available in various models in sizes up to 20 H.P. for residential or business installations. Easy to install, cost less to operate.

BRUNNER
SINCE 1906

BRUNNER EXTRAS

- **Compressor Experience**
- **Product Research**
- **Design Engineering**
- **Wide Product Range**
- **Proven Quality**
- **Complete Dependability**
- **Easy Servicing**
- **Warranted Performance**
- **Nearby Distributor Service**
- **Profit Opportunity**
- **Advertising Support**
- **Sales Promotion Help**

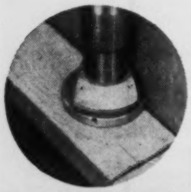


DRIVE a better bargain in bid competition with the safer, action-packed VELOCITY-POWER DRIVER

Because getting the job done faster, for less, is important in today's bid competition, the speed and safety advantages of the Velocity-Power Driver are vital in your contracting picture.

With this tool, fastening and anchoring jobs are finished in seconds! Just load, position, fire! Job's done. Interchangeable barrels let you drive either ¼-inch or ⅜-inch studs from same firing unit. Wide selection of studs—and cartridges and studs are integral to eliminate time-wasting matching and fitting.

Safety features include a spring-loaded safety arm that prevents accidental discharge; permanently attached spall-shield; center-fire cartridges; color-keyed cartridges to assure right load for job; and a barrel design that avoids flash, ricochet, recoil. Write for details.



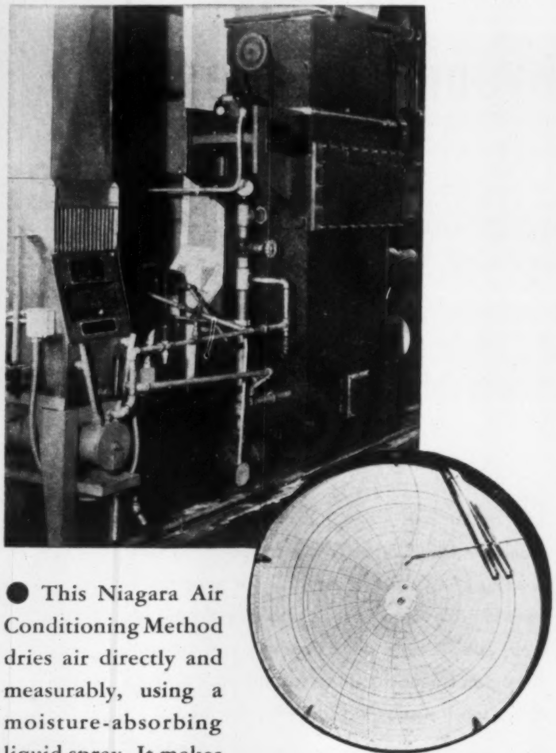
←
Spall-shield can be retracted, or a portion of shield rotated out of the way for easier work in narrow spaces or close-to-the-wall jobs.

ALSO AVAILABLE

Velocity-Power Driver with separate spall-shield for extensive work in deeply recessed areas.

VELOCITY POWER TOOL CO.
201 NORTH BRADDOCK AVENUE
PITTSBURGH 8, PA.

EXACT CONTROL
of Moisture Content
To Improve Your Product
or Protect Your Materials
or for Processes or Tests



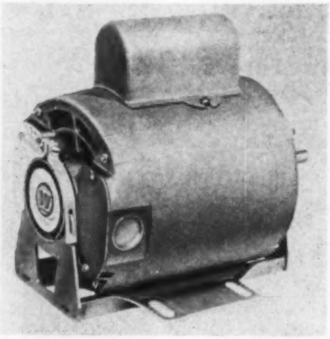
● This Niagara Air Conditioning Method dries air directly and measurably, using a moisture-absorbing liquid spray. It makes humidity control a separate function from lowering or raising temperatures and gives you precise control with thermostats alone; no moisture-sensitive devices are needed. You have simpler, more trustworthy, less expensive control instrumentation. Niagara precise-control installations have the best record for reliability.

Niagara Air Conditioning provides you with any temperature and relative humidity you need. Using "Hygrol" absorbent, it is not expensive to operate, saving the refrigeration commonly used to condense moisture and making re-heat unnecessary in most cases. It gives large capacity with compact, easily-maintained equipment. Ask for Descriptive Bulletins #112 and #121. Address Dept. — HP

NIAGARA BLOWER COMPANY
405 Lexington Ave. New York 17, N. Y.
District Engineers in Principal Cities of U. S. and Canada

with fragrances of spice, pine, floral bouquets, or cedar, its manufacturer reports. It operates when plugged into any a-c outlet. Williams Chemical Co., 487 Broadway, New York.

Fractional HP Motors



A redesigned line of fractional horsepower motors in the NEMA 48 frame size is available ranging from 1/6 through 1/3 hp, the manufacturer announces. The line incorporates a simplified straight through ventilation system with vent holes limited to the bracket areas, according to the company.

On single phase motors, a terminal board design permits change of voltage or motor reversal by interchanging quick disconnect plugs in the motor conduit box. New sleeve bearing construction provides lubrication and nylon thrust washers permit a variety of mounting positions, says the manufacturer. Westinghouse Electric Corp., 401 Liberty Ave., Pittsburgh 30.

Oil Mist Filter

For eliminating oil mist and smoke at its source, the manufacturer's new "Electro-Staynew Mist Collector" is designed for mounting on or near high speed grinding and cutting machines, and is said to remove over 90 percent of these contaminants and return clean air to the area.

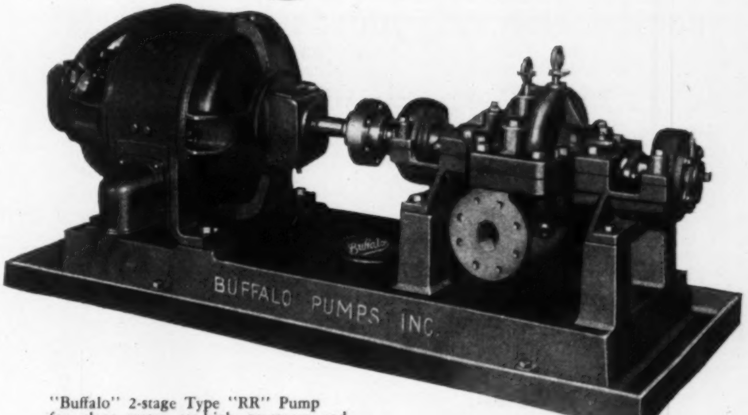
Oil laden air is drawn in at the unit's base and metal chips and abrasives are screened. Mist particles are positively charged in the ionizing section of the cell. Negatively charged collector plates then attract and separ-

You're Actually Buying Low-Cost G.P.M.'s!

Put your pump buying on a basis of *overall costs,* for a true picture of what's the best buy! You're actually buying *delivered gallons,* over the life of the pump. How long the pump lasts—how efficient it is—how much it costs to maintain—are all factors that figure in your cost per delivered gallon.

Users of "Buffalo" Type "RR" Multistage Pumps have continued to enjoy low-cost gpm's, millions of gallons after installation. This is because of their inherent high efficiency, (which keeps your driving power requirements to a minimum) and simple, oversize construction (which keeps maintenance costs rock-bottom)—the "Q" Factor* which has been engineered into every "Buffalo" product for the past 78 years. It will pay you to write for Bulletin 980 and see why an "RR" is bound to give you low-cost gpm's in the long run!

NOTE: The "Buffalo" Pumps line is complete! There's a design for almost any liquid you may handle, under a wide range of hydraulic conditions. Let us know your problem—we'll mail you literature on the right pumps!



"Buffalo" 2-stage Type "RR" Pump for clear water at high pressures and temperatures. Widely and successfully used on boiler feed for many years. 2 and 4 stage models to deliver up to 900 gpm at heads as high as 1500'. Bulletin 980.

"Buffalo" PUMPS

**The "Q" Factor—the built-in Quality which provides trouble-free satisfaction and long life.*

BUFFALO PUMPS, INC.
171 MORTIMER STREET BUFFALO, N.Y.
Subsidiary of Buffalo Forge Company
Canada Pumps, Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

BARBER COLMAN

New Wheelco Combustion Safeguards

FLAMEOTROL
Manual or automatic models
Electrode
Universal Flame-Electrode and Gas Pilot
Lead Sulphide Flame-eye

A totally new standard in combustion safeguards for all fuels!

For all types of commercial and industrial heating equipment . . . whether gas- or oil-fired . . . the *all-new* Wheelco Flame-otrol gives you a new measure of protection against flame failure hazards, plus wider selection of detection systems for maximum design flexibility, ease of installation, and freedom in choice *and use* of burners, pilots, and fuels.

Manual or *automatic* models give you total burner and fuel shutdown, plus true "safe-start" operation, with automatic delay for the safe-start circuit!

Phone your nearby Wheelco Representative for help in designing and installing a properly integrated *electronic* combustion safeguard system for single- or multiple-burner applications.

Write for complete facts

Helps you specify . . . gives you information on six outstanding design features of the *all-new* Wheelco Flame-otrols . . . describes exclusive user-benefits never before offered in a low-cost instrument. Write for Bulletin F-6570, *today!*

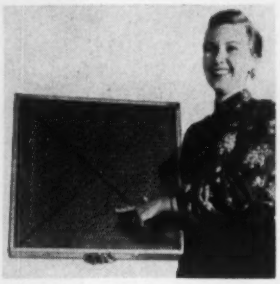
WHEELCO INSTRUMENTS DIVISION

BARBER-COLMAN COMPANY, DEPT. O, 1501 ROCK ST., ROCKFORD, ILLINOIS
BARBER-COLMAN OF CANADA, LTD. • TORONTO, ONTARIO, CANADA

Industrial Instruments • Automatic Controls • Air Distribution Products • Aircraft Controls • Small Motors
Overdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

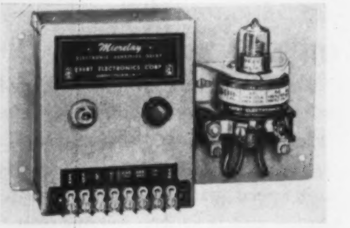
ate oil from the air stream, allowing clean air to pass through, the company reports. Collected oil (2 to 6 gal daily, according to the manufacturer) can be stored in the reservoir or piped back to the machine. Dollinger Corp., 11 Centre Pk., Rochester 3, N.Y.

Air Filters



The manufacturer's new line of air filters are as follows: Panel impingement type—available in single panel and multiple banks of filters. The unit consists of galvanized screen filtering medium arranged in closely spaced rows of double air scoops. Self washer type—an automatic washing device attachment for banks of panel impingement filters which cleans the filters of collected dirt particles. Traveling curtain type—a motor driven assembly which rotates the filter panels through an oil bath for constant cleaning of the filter media. Trion, Inc., 1000 Island Ave., McKees Rocks, Pa.

Electronic Relay



For control of high power, high current loads up to 60 amp or 3 hp from very low current, low power devices or circuits, the manufacturer's new "Micrelay" is an a-c operated, electronically controlled unit without rectifiers or sensitive armature type relays, the company states.

BARBER COLMAN

UNI-FLO ENGINEERED

Air Distribution

Puts shoppers in buying mood at Burdine's . . .

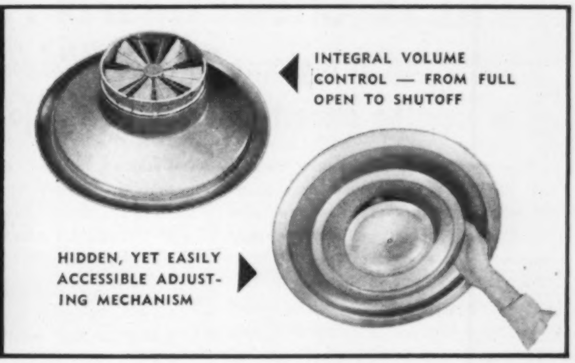
It isn't often that a mechanical engineer says "The equipment has usually exceeded the performance of published data." Yet that's the comment made after Uni-Flo equipment was installed throughout the beautiful new home of famed Burdine's in Miami Beach, Florida. Not only was performance above par, but, as can be seen below, the Venturi-Flo Diffusers are small and inconspicuous in appearance, harmonize with the decorated ceilings, are easy to adjust. Experience indicates, too, that Venturi-Flo Diffusers keep ceiling smudge at a minimum.

Architects: WEED, RUSSELL, JOHNSON, AND ASSOCIATES. *Interior Designer:* RAYMOND LOEWY. *Structural Engineers:* NORMAN J DIGNUM AND ASSOCIATES. *Mechanical Engineer:* R. L. DUFFER. *Air Conditioning Contractor:* HILL-YORK SALES CORP.

New, two-story building (83,400 square feet) covers approximately a city block, provides an ultra-modern, luxurious setting for Burdine's "Sunshine Fashions."

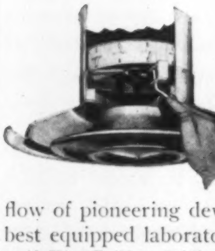
Entire store is air conditioned for shopping comfort. Venturi-Flo Diffusers distribute the conditioned air quietly, unobtrusively, efficiently.

Using from 15% to 100% outside air, the atmosphere throughout the building is kept fresh and inviting for personnel and shoppers, regardless of store traffic and weather conditions.


INTEGRAL VOLUME CONTROL — FROM FULL OPEN TO SHUTOFF
HIDDEN, YET EASILY ACCESSIBLE ADJUSTING MECHANISM

Venturi-Flo Ceiling Diffusers provide efficient diffusion, rigid construction, quiet operation, easily adjustable deflection and volume control, advanced styling.

BLAZING THE TRAIL TO BETTER AIR DISTRIBUTION



Round Ceiling Diffusers . . . an early pioneering success

Barber-Colman Company's entrance into the air distribution field twenty years ago started an increasing flow of pioneering developments. From the largest and best equipped laboratory in the industry came the Venturi-Flo Ceiling Diffusers, first of a series of ceiling diffusers designed for balanced air distribution in modern buildings. In these units, air patterns are adjustable after installation from vertical to horizontal discharge. A wide range of styles and sizes is available for recessed or surface mounting, with or without integral lights. Accessories include volume control, air flow balancing and air turning devices. For latest literature and expert engineering advice, consult your nearby Field Office or write us.

Barber-Colman Company

Dept. O, 1101 Rock St., Rockford, Illinois, U. S. A.

KENNEDY

gives you the answers to your Valve questions . . .

KENNEDY
Bronze Valve Check Chart
How to select the right valve for your specific job!
Gate Valves
Globe, Angle Valves
Check Valves
Seats and Discs
Bonnets
Stems
THE KENNEDY VALVE MFG. CO., ELMIRA, N.Y.
VALVES
PIPE FITTINGS
FIRE HYDRANTS

with the New KENNEDY VALVE Check Charts . . .

show you at a glance *How, When, Where* to use the correct valve to fit the job!

Now you can tell at a glance the correct KENNEDY Valve to use on a specific job . . . and why! These new valve Check-Charts show you the important features of the various types of KENNEDY Valves and explain their proper installation and use. Show you which valves go where . . . list specific Figure Numbers for accurate selection . . . describe why that valve should be used . . . and even suggest additional uses for Kennedy Valves.

One chart describes Kennedy Bronze Valves and its companion chart lists uses and conditions for Iron-Body Valves.

Designed for fast, easy reference, contains the answers to most of your valve questions. Large enough (16½" wide x 25" deep) for easy reading and hangs right on your wall in your office or shop.

Here are long-needed valve Check-Charts that give you quick, correct information and show you how and why certain valves are built for specific jobs. Get your Kennedy Valve Check-Charts today!

• GET YOUR KENNEDY VALVE Check Charts NOW! . . . ask your nearest KENNEDY Distributor or WRITE direct.

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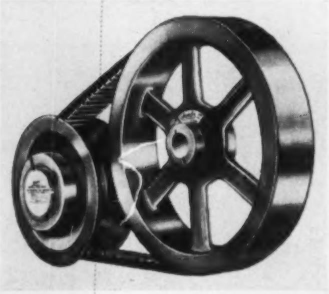
KENNEDY VALVE MFG. CO.
1021 E. WATER ST. ELMIRA, NEW YORK
• VALVES • PIPE FITTINGS • FIRE HYDRANTS
OFFICE-WAREHOUSES IN NEW YORK, CHICAGO, SAN FRANCISCO • SALES REPRESENTATIVES IN PRINCIPAL CITIES

EQUIPMENT DEVELOPMENTS

Continued

Built in power line isolation permits flexibility of external control circuitry, according to the manufacturer. The instrument employs one miniature thyratron tube and includes a plunger relay with 35 or 60 amp contact rating at 115 volts, a-c as required. Ebert Electronics Corp., 212-226 Jamaica Ave., Queens Village 28, N.Y.

Variable Speed Drive



A new, smaller variable speed drive, designed to give infinitely variable speeds within a 2 to 1 range ratio for 1 to 5 hp drives, has been added to the company's line.

Features cited by the manufacturer are simultaneous movement of both flanges by a single adjusting screw to change the pitch diameter, simplified design to provide positive clamping of the flanges to eliminate fretting corrosion, single wide range belt to give maximum horsepower efficiency and less shaft overhang, and no lubrication requirements. T. B. Wood's Sons Co., 1275 Fifth Ave., Chambersburg, Pa.

Air Conditioners

New air conditioners are available in ¾ hp (model 5EZ40), 1 hp (5EZ50) and 1½ hp (5EZ80) models. Faster cooling is obtained by a blower which forces cool air across a room at a 45 deg angle and forces warm air down onto the floor, the company states.

Cooling capacities range from 500 sq ft for the ¾ hp model to 1000 sq ft for the 1½ hp model, according to the manufacturer. All three units have automatic thermostats which react on a plus or minus 4

AIR CONDITIONING INCREASES IMPORTANCE OF RUSTPROOF DUCT SYSTEMS

The almost universal use of air conditioning in modern building can bring up problems of condensation from moist air coming in contact with cold metal. Even though dehumidification is part of the air conditioning process, it can scarcely be complete in the normal usage of a building. When the metal used is susceptible to rust, air conditioning increases the possibility of rust damage.

Aluminum the Only Practical Rustproof Duct Material

Use of aluminum for ductwork makes rust impossible. Though condensation may still occur, there can be no damage to the ducts and no transfer of rust stains to adjacent surfaces.

Experience in Fabrication Makes Cost of Aluminum About Equal

The authoritative "Building Construction Cost Data, 1954" says: "On a pound basis, almost 3 times as much ductwork can be shop fabricated and erected in aluminum as in steel. The cost of finished duct in place on a job basis is about the same, especially in areas where aluminum is regularly fabricated."

Other Advantages of Aluminum Besides Freedom from Rust

Two other advantages of aluminum can effect substantial economies, particularly in extensive commercial and industrial installations. These are (1) faster air flow, due to aluminum's smoother surface; and (2) lowest emissivity. Aluminum's capacity to "let out" heat is approximately 5% compared to 25% or more for galvanized steel.

The air conditioning ducts of this Veterans' Hospital, Buffalo, N. Y. are all of rustproof Reynolds Aluminum.

Architects: James, Meadows and Howard, Buffalo, and Eggers and Higgins, New York, N. Y.

Heating and Ventilating Contractors: Coon-Fuchs, Inc., 58 Good Road, Buffalo 25, N. Y.

Free Application and Data Handbook on Aluminum

ALUMINUM
AIR DUCTS

Reynolds offers, free, a new and completely up-to-date handbook on the use of Aluminum in heating and air conditioning ducts. Please mail the coupon for your copy.

Reynolds Metals Company, **2033**
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Please send me your new manual, "ALUMINUM AIR DUCTS."

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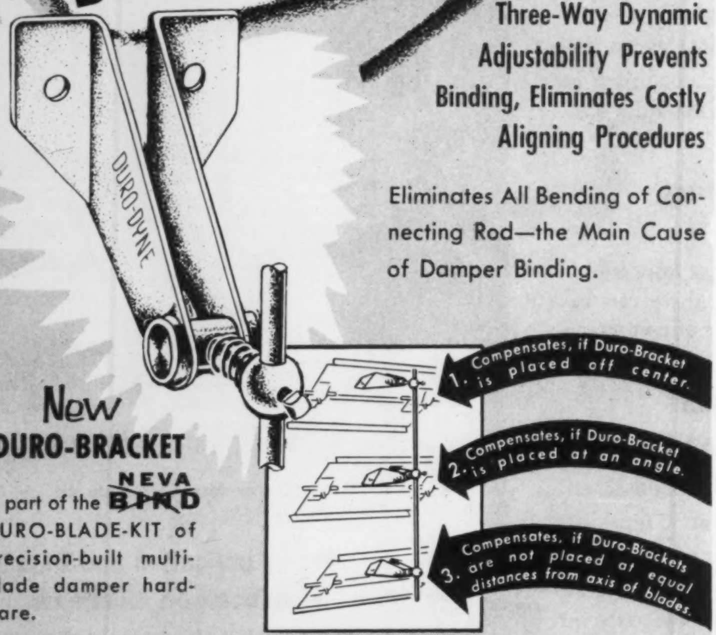
SEE "MISTER PEEPERS," starring Wally Cox, Sundays, NBC-TV Network.

REYNOLDS ALUMINUM

LOUVER DAMPERS WON'T BIND with the Sensational NEW NEVA ~~BIND~~™ DURO BLADE KIT
Pat. Pend.

Three-Way Dynamic Adjustability Prevents Binding, Eliminates Costly Aligning Procedures

Eliminates All Bending of Connecting Rod—the Main Cause of Damper Binding.


DURO-DYNE
1. Compensates, if Duro-Bracket is placed off center.
2. Compensates, if Duro-Bracket is placed at an angle.
3. Compensates, if Duro-Brackets are not placed at equal distances from axis of blades.

New DURO-BRACKET

A part of the NEVA ~~BIND~~ DURO-BLADE-KIT of precision-built multi-blade damper hardware.

VALUABLE FEATURES NOT FOUND IN OLD STYLE BRACKETS

- Absolutely non-binding action. New DURO-BRACKET assures perfect blade action even though brackets are placed *off-center*, placed *at an angle*, or *not placed equally distant from axis of blades!*
- New DURO-BRACKET need not extend beyond edge of its blade! It allows for full opening and closing of blades without brackets hitting duct. Connecting rod will not interfere with full blade opening.
- Pivot and set screw are pre-assembled onto new DURO-BRACKET for you. No loose parts to assemble.

Sold by leading jobbers throughout the U.S.A. and CANADA.

DURO-DYNE Corporation

800-D Third Ave., New Hyde Park, New York

deg variance, says the company. Hotpoint Co., 5600 W. Taylor St., Chicago 44.

Chlorinator

A solution feed type chlorinator with a corrosionproof polymer impregnated fibre glass cabinet uses the diaphragm regulator principle engineered to permit a mechanically enclosed chlorinating machine constructed entirely of corrosion-resistant materials, according to the manufacturer.

Manual adjustment of chlorine gas injection is made by the rate valve on the front of the cabinet, and the actual flow rate is observed through the glass flow meter. Six metering tube and float combinations provide 10 to 1 or greater overlapping flow ranges from a minimum of 100 lb per day to a maximum of 8000 lb per day of chlorine gas, the company states. Fischer & Porter Co., Hatboro, Pa.

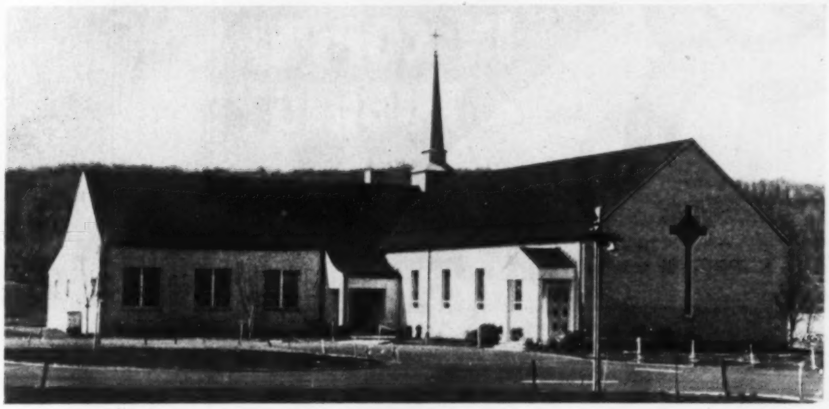
Smoke Indicators

Two new smoke indicators have been designed to meet local requirements for installation on any size and type furnace and for any type and grade of fuel used, the manufacturer reports.

Model "300-P90" provides adjustable automatic control for secondary (overfire) air injected by way of turbo blower jets or venturi steam jets to supply oxygen deficiency and turbulence required to consume volatiles in the fire box and minimize discharge from the stack, says the company.

WARM AIR HEATED...

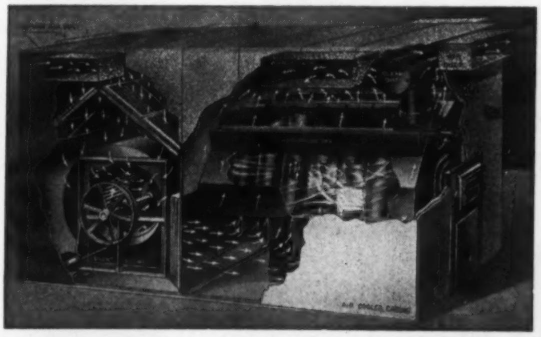
by Campbell



Our Lady of Fatima Church, Wilton, Connecticut. Heated with two Campbell Oil-fired heaters. Installed in 1953, by Ridgefield Plumbing & Heating Co., Ridgefield, Conn.

ECONOMICAL CHURCH HEATING

Low in first cost, low in operating cost, low in installation cost, Campbell Warm Air Heaters meet every requirement for church heating. Campbell Heaters are compact, operate very quietly, deliver quick abundant heat with amazing fuel economy. Available for all fuels in capacities from 725,000 to 3,000,000 BTUs. Let our engineers help you with layouts and specifications on your next large heating job.



MANUFACTURERS' AGENTS

We have a number of attractive openings for manufacturers' agents who call on heating contractors and architects. If interested, please state territory you cover.

CAMPBELL HEATING CO.

Des Moines 17, Iowa

I am interested in your proposition for manufacturers' agents.

My territory covers ....

NAME ....

ADDRESS ....

CITY .... ZONE .... STATE ....

CAMPBELL HEATING COMPANY

Des Moines 17, Iowa

What PROVES CHARACTER IN COPPER TUBING?

BENDABILITY

Temper plays a key role in the bendability of copper tubing. United Copper Tubing gives you the uniform grain structure and controlled temper which are ideally suited for bending.

EXPANSION FACTORS

When specifications call for mechanical or hydraulic expansions, the tube that makes the requirement without failure has the type of built in character you can depend on!

It is in extreme use that really good copper tubing identifies itself and copper tubing character is firmly established in United Copper Tubing.

UNITED COPPER TUBING HAS THESE MAJOR CHARACTER ASSETS AT THE START

Completely Uniform Temper
Sparkling Cleanliness Inside and Out
Tolerances Precisely as Called For (down to the closest!)

UNITED COPPER TUBING HAS THE DEPENDABLE "USE" CHARACTERISTICS YOU WANT IN YOUR COPPER TUBING

UNITED WIRE
AND SUPPLY CORP. PROVIDENCE, R. I.
Permanently United

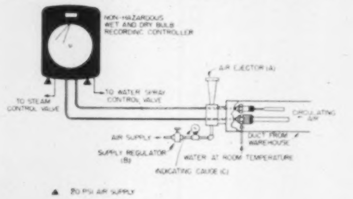
SALES OFFICES: NEW YORK • PHILADELPHIA • NEWARK • BOSTON
HARTFORD • SPRINGFIELD • ROCHESTER • MINNEAPOLIS • PITTSBURGH
LANSING • CLEVELAND • CHICAGO • ST. LOUIS • LOS ANGELES
PROVIDENCE • FORT WORTH • ORLANDO

EQUIPMENT DEVELOPMENTS

Continued

Model "300-P85" provides for audible and/or visual signal only during periods of excess smoke for warning firemen to take corrective measures. De-Tec-Tronic Corp., 2512 N. Halsted St., Chicago 14.

Humidity Instrumentation



Where a wet bulb humidity instrument is used for measurements in a hazardous area and the expense of explosionproofing presents a problem, the wet bulb can be placed in a metal housing and a small air ejector used to draw an air sample over it without the use of a blower, the company says.

As diagrammed, the wet and dry bulbs are enclosed in a small length of stove pipe, one end open to the hazardous area and the other connected to the ejector. Operated by air from the plant's compressor, the ejector pulls a continuous sample over the bulb for the humidity measurement, according to the manufacturer. An air supply regulator and gage provide the necessary adjustments.

The housing may be constructed by a tinsmith, using available materials and makes it unnecessary to use an explosionproof blower, the company reports. The Foxboro Co., Foxboro, Mass.

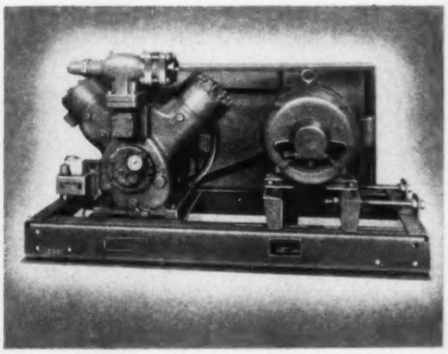
Utility Fans

A new line of assembled "ready-to-install" utility fans, designed to have high ratings over its range of sizes, is available with either direct or belt drive, and forward curved or backwardly inclined blades, its manufacturer reports. Units include standard NAFM sizes between 4½ and 30 in. wheel diameter; capacities up to 15,450 cfm and static pressures up to 2 in. of water are available, the company says.

THE STERLING, MIAMI BEACH'S NEWEST ocean front hotel, enjoyed a banner first season last winter. Owner David Rosner assigns a good share of the credit to his Worthington-engineered air conditioning system which cools the 142 rooms and 186,000 cubic feet of dining and lobby space. "Maintenance service (routine checkups) couldn't be better," says Manager Sam Rosner, with an eye on the potential business losses (running into thousands of dollars) that might follow mechanical breakdown. System includes both central and packaged air conditioners.

Worthington teams central and packaged air conditioners to cool new Miami Beach hotel

3-TON, 7½-TON, AND 15-TON PACKAGED AIR CONDITIONERS with the famed Freon compressor like this serve as booster units to keep Sterling's crowded bar, television and card rooms cool without over-cooling other areas. Write for facts to Worthington Corporation, Air Conditioning and Refrigeration Div., Section A.5.66, Harrison, N. J.



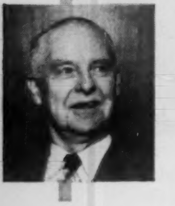
BASIC AIR CONDITIONING UNIT for the Sterling Hotel is this 60-ton Worthington Freon compressor, end product of a million-dollar research program. Worthington equipment includes two Freon compressor units, three packaged air conditioners, and one shell and tube condenser. And Worthington's special cutoff system keeps power costs low when only minimum temperature changes are required. **A.5.66**

WORTHINGTON

Climate Engineers to Industry, Business and the Home

"Janitrol Engineering...

MADE 10 UNITS DO THE JOB OF 15 FOR US"



A STATEMENT OF Mr. H. M. Watkins, Manager, Layne-Bowler Pump Co., 2943 S. Vail, Montebello, Calif.

"For our new Montebello plant, Janitrol engineers took advantage of the quantities of stray heat from processing equipment that would have accumulated near the top of our saw-tooth roof. This pre-heated air was recirculated by Janitrol Gas-Fired Unit Heaters, placed near each roof peak, high above the floor. Janitrol engineers of Natural Gas Equipment, Inc., Pasadena, found that in this particular installation only 10 units were required, as compared with 15 when placed at the normal 8-foot height.

"This design saved us 1/3 on our original heating installation cost. And with fewer units, we've realized substantial fuel savings ever since."

Heat from these Janitrol Unit Heaters is directed to the floor with high velocity nozzles.

The experience of Janitrol engineer-representatives can help you select proper equipment to get more value from your heating investment. Whether you are building or remodeling, send us your problem. No obligation.

Janitrol Heating & Air
Conditioning Division,
Surface Combustion
Corporation, Columbus
16, Ohio. In Canada:
Alvar Simpson Ltd.,
Toronto 13

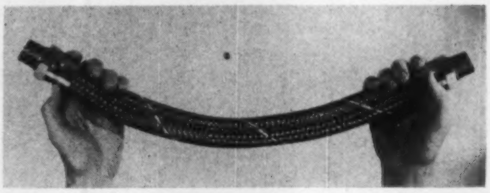
Janitrol
GAS-FIRED UNIT HEATERS

ALSO MAKERS OF
Surface INDUSTRIAL FURNACES Kathabar HUMIDITY CONDITIONING

EQUIPMENT DEVELOPMENTS *Continued*

Other features cited by the manufacturer are low outlet velocity, low noise level, versatility, low maintenance, lockseam housing and overhanging sheave adjustable drives to permit replacement of fan belts without disassembly. The Trane Co., LaCrosse, Wis.

Flexible Connectors

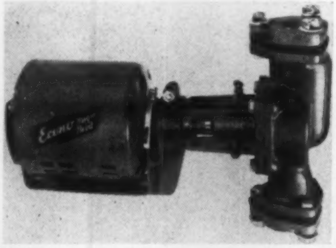


"Flexpipe" flexible connectors to control thermal expansion in wet heating systems consist of seamless phosphor bronze tubing with brass NPT male fittings attached to each end.

The series is designed to dampen vibration, take care of expansion and contraction in risers and supply lines, to connect outlets which do not line up, and to compensate for other piping "travel," the manufacturer reports. Assemblies are available in diameter sizes 1/4 through 1 1/2 in., in overall lengths 8 through 28 in. The American Brass Co., American Metal Hose Branch, 414 Meadow St., Waterbury 20, Conn.

Circulator

"Magic Head," a circulator with a head designed for extra power, is made to deliver maximum power for circulating water in complex radiant panel heating systems, base-board systems, and bends, etc., and split level construction where long tubing footage, numerous fittings put heavy line resistance into the flow of water in the system, according to its manufacturer. This design incorporates the company's "Open Fin Power Pellor" coupled with oversized waterways, which, it is claimed, gives extra power and capacity for the pump to operate at sustained head pressures without overloading the motor. Econo Products Co., East Haddam, Conn.



Electrode

"Eutec-HandOmatic No. 2" is a new a-c/d-c contact arc gap electrode for welding carbon steel, featuring rapid deposition, good weld appearance and automatic slag removal, its manufacturer states. Slag coverage is complete without slag inclusion and re-

SAFETY FILM
XX
SUPER-XX
2-B

how

FILM MAKERS CUT CASTING, CHILLING, DRYING COSTS

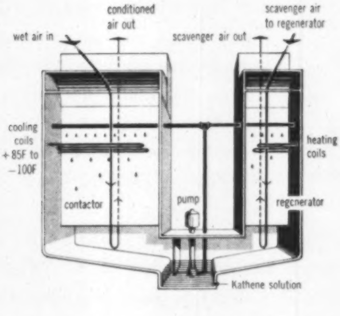
The leading manufacturers of photographic film and paper needed dry air at low temperatures for their casting, chilling, and drying processes. And they wanted it *without* frost, excessive reheating or aftercooling, high power requirements, carry-over, corrosion, and high maintenance and service costs.

They obtained air at the precise conditions they wanted by installing Kathabar humidity conditioning units, and avoided problems common to other dehumidification systems. For the casting process, where film dope changes from a viscous liquid to a transparent strip, Kathabar units deliver air at 104F and 47.5 grains/lb. with 53F water. For chilling the emulsion, they deliver air at 6.5F, 5 grains/lb., frost-free with OF refrigerant. For drying the emulsion, they provide 140F, 36-grain air, with 75F water.

The results have been better process control, improved product quality, and lower costs. One manufacturer, for example, saved $40,000 annually in excess refrigeration by using Kathabar units for drying photographic paper.

Similar results have been achieved with Kathabar units in other industries: foods, pharmaceuticals, petrochemicals, brewing, glue, candy, atomic energy, lithography. For details, write for Literature Group K54-1C, including our just-published brochure, "HUMIDITY CONDITIONING."

WHAT COULD BE SIMPLER?



Air to be conditioned passes through the contactor, where an absorbent solution removes moisture (the amount depends on the automatically-controlled temperature of the solution). In the automatic regeneration, about 15% of the solution is heated, and the moisture it releases is blown out the window.

Kathabar®

HUMIDITY CONDITIONING

SURFACE COMBUSTION CORPORATION • TOLEDO 1, OHIO

ALSO MAKERS OF **Surface** INDUSTRIAL FURNACES **Janitrol** AUTOMATIC SPACE HEATING

The satisfaction of knowing

the right heat exchanger for any requirement — complex or simple — is readily available from TACO. Quality-control manufacturing, advance designing, know-how engineering have made TACO heat exchangers first choice of those who demand top performance, minimum maintenance. Complete information, plus "pin-point" selection charts available upon request.

Condensate Coolers • Converters • Chillers • Circulating Pumps
Fuel Oil Heaters • Oil Coolers
Radiation Heaters • Tank Heating Units • Water Heaters

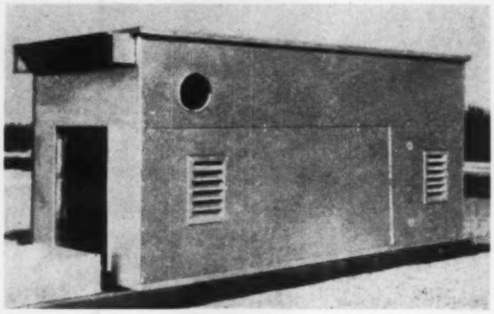
TACO HEATERS, INCORPORATED
1160 Cranston Street
Cranston 9, R. I.

Taco

moval is automatic even when beads are run side by side, according to the company.

"Low heat input" requirement is another feature cited by the manufacturer. Eutectic Welding Alloys Corp., 40-40 172nd St., Flushing, N.Y.

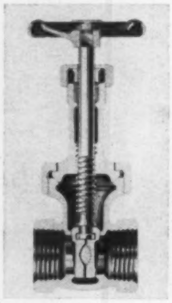
Remote Air Conditioner



A new air conditioning unit for cooling of one story industrial and commercial buildings is installed on the roof—out of sight and hearing, but accessible for service, its manufacturer reports.

With the only inside evidence of the unit being a single opening in the ceiling for the combination air diffuser and return, no floor space is used, no ductwork is required, no plumbing hookups or drains are needed, and operating noise is at a minimum, according to the company. Alco Refrigeration, 3952 St. Clair Ave., Cleveland 14.

Gate Valves



Valves are equipped with a rising stem which is designed to give a visual indication of the position of the wedge. Its operating threads are out of direct contact with the fluid. Stems are made of an aluminum-silicon-bronze alloy for corrosion resistance and durability, says the company.

Bronze gate valves for general full flow service on steam, water, oil or gas are available in sizes ranging from 1/4 to 3 in. in either split or solid wedge, the manufacturer announces. R-P & C Valve Div., American Chain & Cable Co., Inc., Reading, Pa.

Vent and Drain Valve

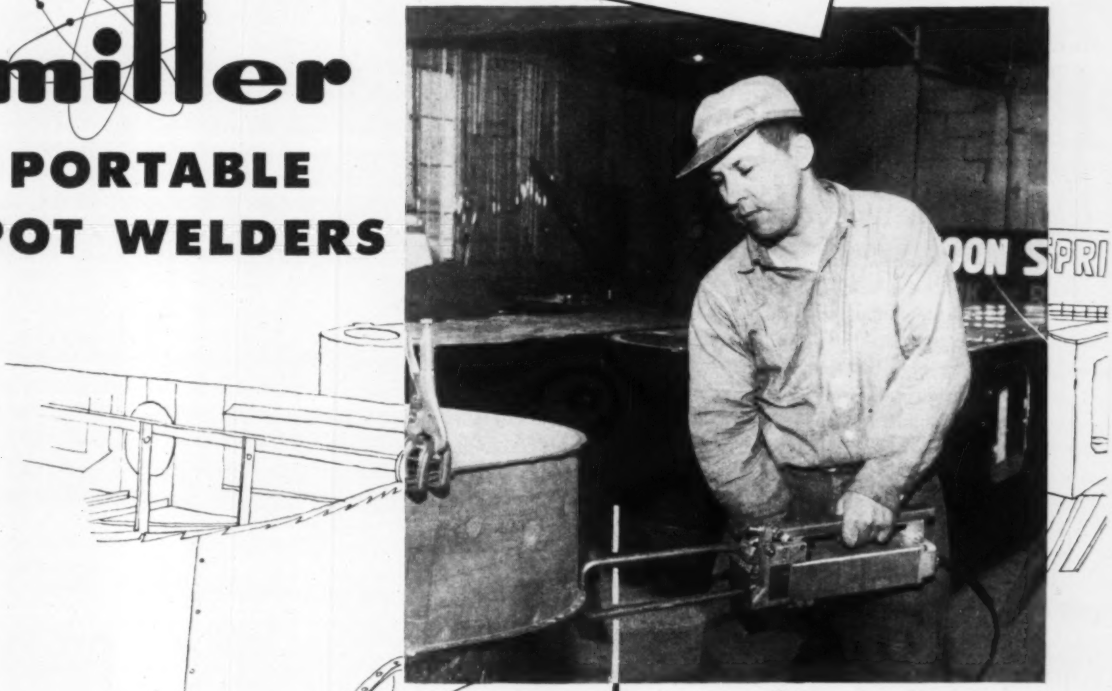
The new stainless steel "Graloc vent-drain-bleeder" valve has been designed for 20,000 psi working pressure or temperatures to 1200 F, the manufacturer states. A pressure aided seat is engineered to make the unit leakproof for oil, water, gas or steam service.

"SPOT" SEAMS— *easier... faster... cheaper*

WITH

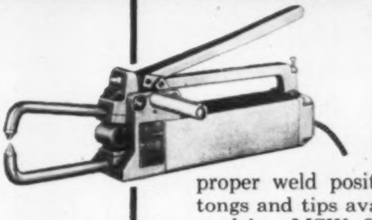
miller

PORTABLE SPOT WELDERS



This is the welder you hold in your hands, like any other small power tool. No need to wrestle the *work* to the *welder*, for Miller MSW Series welders weigh only 23 lbs., Model LMSW-52 only 31 lbs.; detachable side handle threads into either flank of welder, enables operator to maneuver it fast and effortlessly.

We manufacture a complete line of portable and pedestal spot welders, manually or air-operated to fit every shop requirement. A card or a call will bring complete free literature and the name of your nearest Miller Distributor.



Multi-pressure tong lever—on top of welder—insures positive material "fit-up," locks tongs firmly for proper weld position. A wide variety of tongs and tips available on order, for both models. MSW Series Welders will spot clean mild steel up to ⅛" combined thickness, or two pieces of 20 gauge galvanized. Larger Model LMSW-52 (illustrated) can weld stainless or mild steel up to 3/16" combined thickness, or two pieces of 16 gauge galvanized steel.

Miller MSW-T and LMSW-T Timers control "weld-time," assure neat and uniform spots, prevent burning of tips through excessive current time. Any Miller Spot Welder ordered without a timer can later be factory-converted for use with it at slight additional cost.

25th ANNIVERSARY

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miller

MANUFACTURERS OF QUALITY ELECTRIC ARC AND SPOT WELDERS SINCE 1929

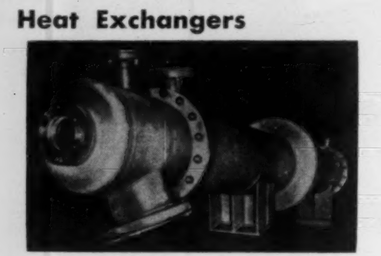
ELECTRIC MANUFACTURING COMPANY Inc. • Appleton, Wisconsin

EQUIPMENT DEVELOPMENTS

Continued

Applications cited by the company are for vents and drains at the high and low points of piping, equipment and instruments, to bleed at double block valves and as freeze drains. Gray Tool Co.; P. O. Box 2291, Houston.

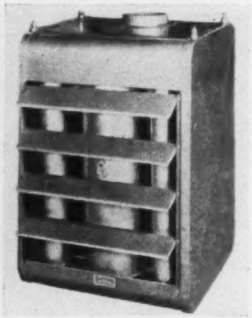
Heat Exchangers



A new line of semistandard heat exchangers has the following optional design features, cites the manufacturer: Nozzles may be of any size or in any location required by the installation. Exchangers may be specified with or without an expansion joint. Models are available in stainless or carbon steel or other alloys.

The units have been designed for pressures of 150 psi and higher, and construction details meet ASME code specifications and TEMA Class C standard, the company reports. Downingtown Iron Works, Inc., Wallace Ave., Downingtown, Pa.

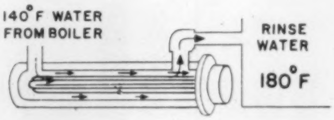
Oil Fired Unit Heater



A new 140,000 Btu oil fired, suspended type unit heater is a self contained, factory assembled and wired unit, requiring only a vent, electric outlet and tap to fuel supply, the manufacturer announces. The unit's fan provides a throw of 50 ft and can be used in the summer for ventilation, the company says.

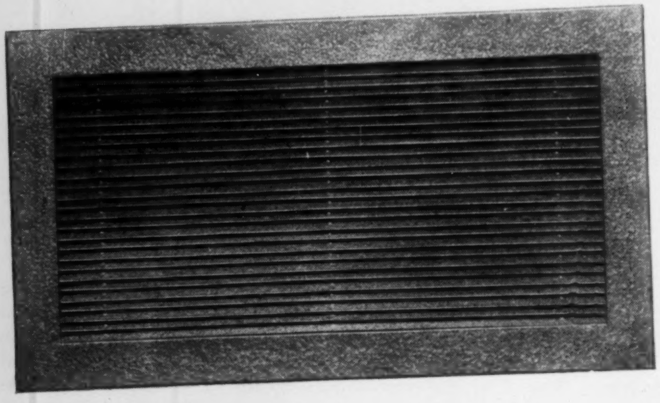
The heater burns No. 2 commercial standard grade fuel oil at an efficiency of 80 percent, according to the manufacturer. Interstate Heater Mfg. Co., 2627 W. 6th Ave., Denver.

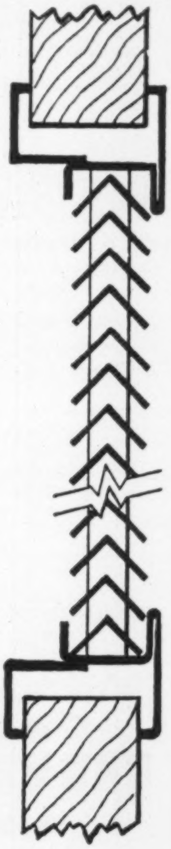
Circulation Heater



The problem of obtaining rinse water for commercial kitchens at temperatures that meet health codes can be solved by installation of an instantaneous electric circulation heater in the line near the washing machine, according to the company.

This heater requires no extra space since it can be placed in the unused space under the washing table, the manufacturer reports. The unit is designed with built in insulation, pipe connections and thermostat. Edwin L. Wiegand Co., 7610 Thomas Blvd., Pittsburgh 8.





- **CUTS INSTALLATION TIME OVER ½!**
- **EASY TO INSTALL** *Anyone Can Do It!*
- **COMPLETE—NO WOOD MOLDINGS TO ADD!**

NEW! THIN CORE GRILLE FOR DOORS – PARTITIONS ¼" to ¾" THICK!

First Grille ever designed specifically for thin doors and partitions. Anyone can install it in just a few minutes time. No close tolerances required . . . almost a half-inch extra on sides for positioning. Telescoping auxiliary frame fastens to grille with posts and screws. Clamps tight. No holes to position. Practically no danger of ruining door. No wood moldings. All steel. Rattle-proof. No vision, with 80% free area. Available with or without frame, all sizes. Gray or tan prime coated, or Hammertone finish in gray or bronze.

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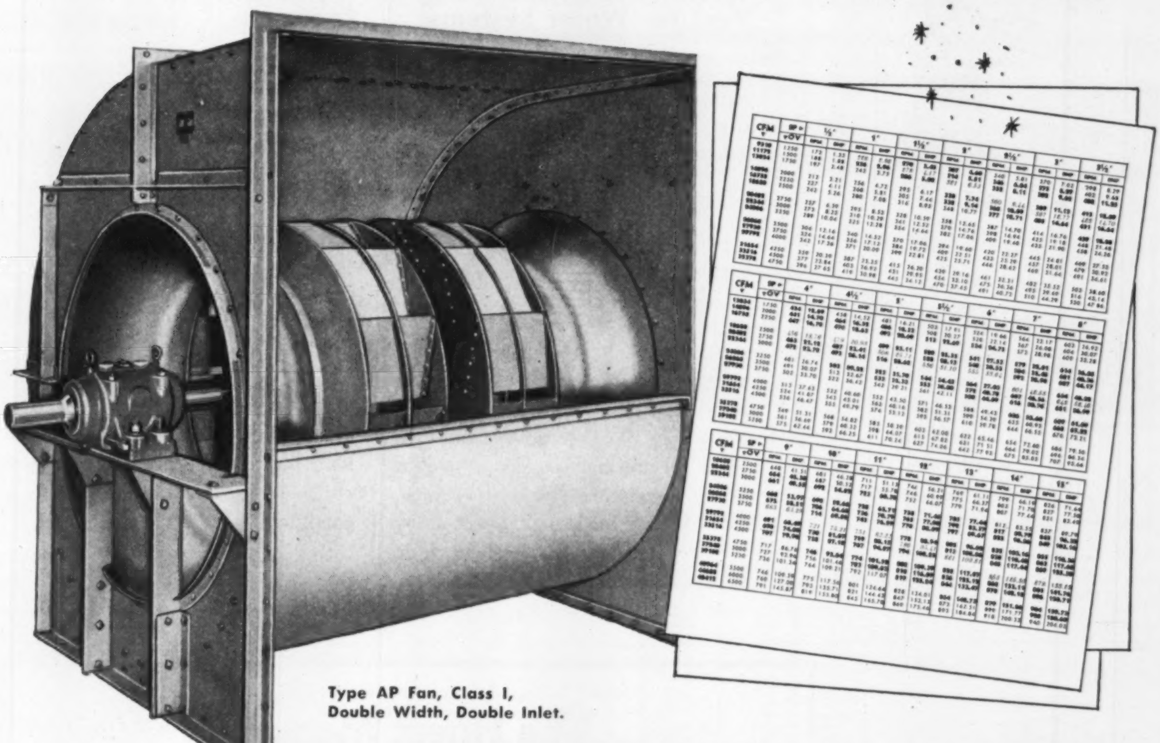
The Product BEHIND the

PERFORMANCE TABLES



Type AP Fan, Class I,
Double Width, Double Inlet.

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WHEN YOU SPECIFY AND USE

Bayley FANS

AND HERE'S WHY:

1. **WIDE EXPERIENCE** supplies a *sound basis* for both standard and custom designed Fan applications.
2. **AIR ENGINEERING** — creates *correct design* for smoothest performance.
3. **PRECISION COMPONENTS** — insure maximum realized efficiency.
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WRITE for your copy of Bayley Bulletin 42-AP

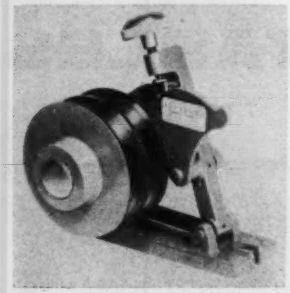
Bayley BLOWER COMPANY

6600 W. Burnham Street • Milwaukee 14, Wisconsin

EQUIPMENT DEVELOPMENTS

Continued

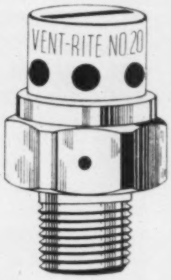
Variable Speed Drive



The new "Cub B" variable speed transmission line includes two types and seven sizes and is designed for applications in the ½ to 1 hp range which require a speed range of 3-1 or less.

The unit consists of double variable pulleys on a ball bearinged countershaft which can be pivoted laterally between the drive and the driven pulley, the manufacturer reports. The change in center distances adjusts the variable pulleys to running diameters, and speeds selected are maintained by a handle and locking knob. The machined cast iron pulleys are smooth sided rather than interlocking. Standard Transmission Equipment Co., 70 W. Union St., Pasadena 1, Calif.

Vent for Water Systems



A new automatic vent for hot water heating systems has hygroscopic fiber discs which are designed to open to allow air to vent and then close to prevent passage of water. When a radiation unit is being filled, fast venting may be provided by turning the cap. Water flows from a single vent hole to signal that the unit is full, the company says.

The vent is for pressures to 50 lb psi and is engineered for installation at locations in the hot water system where air may accumulate. Anderson Products, Inc., 17 Tudor St., Cambridge 39, Mass.

Room Air Conditioner

The "hideaway" window unit of the manufacturer's 1955 room air conditioner line is designed for long life, quiet operation, and high efficiency under a wide range of conditions.

The unit can be installed through the wall, built into a storage wall, installed at the top of the window

Yula

A.S.M.E. CONSTRUCTED

CONVERTORS

The Finest Money can Buy

General application of Yula Convertors is water through Tubes and steam in the Shell. In some instances, water to water is used. Convertor shown is "U" tube construction. Tube bundles engineered for easy removal. Also furnished in Straight tube design, channel construction with Cover Plate for easy cleaning. Free Engineering Service on your Convertor problems.

Investigate Yula before you order

OTHER YULA PRODUCTS:

Freon Coolers . . Instantaneous Heaters . . Condensate Coolers . . Yulatrol Fuel Oil Detectors and YT "U" Tube Fuel Oil Heaters . . Steam Oil Preheaters . . Suction Oil Heaters . . Mixing Valves

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YULA WATER HEATERS, INC.

166 West 225th Street, New York 63, N.Y.

UNMATCHED ACCURACY

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a
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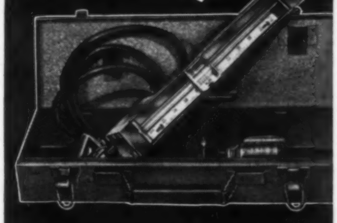
Everything you
need . . . for
field instrument calibration



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- ★ *Magnifying sight glass*
- ★ *Mirror for resolving parallax*
- ★ *Built-in level indicator*
- ★ *Precision-bore pyrex tubing*
- ★ *Built-in fluid seal*
- ★ *All stainless steel construction*

Write for Bulletin B-2862.

Meriam Manometer Instrumentation
. . . for pressures, vacuums,
flows, liquid levels.

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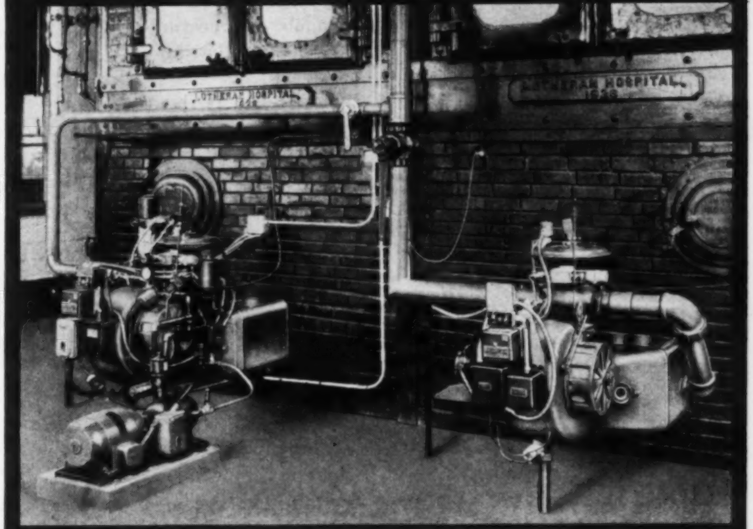
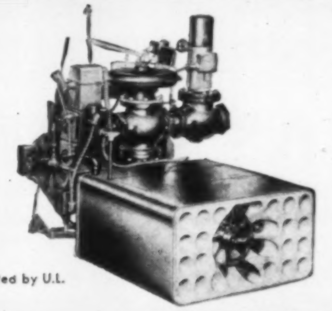
INSTRUMENT COMPANY
10920 Madison Ave. • Cleveland 2, Ohio

Mettler "FAN-AIR" Burners modernize hospital boilers!





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Why consulting engineers specify Mettler

Lifetime integrated multi-port combustion tile provides complete efficient fuel burning . . . exchange of gas orifices gives wide capacity range for your exact needs . . . exclusive Mettler pilot rectification control system assures safer combustion . . . completely flexible operation with mechanical or natural draft . . . greater efficiency and quality at lower cost . . .

These hospital boilers have been modernized for life because Mettler "FAN-AIR" Gas and Dual Fuel Burners are *years ahead!* For, no other burner offers so many money-saving features and *new* safety factors . . . yet costs so little. A completely packaged and surprisingly flexible heating system, the "FAN-AIR" pays its way quickly in fuel savings. Eliminate trouble-shooting calls and win satisfied customers — write for literature and specifications on "FAN-AIR" Burners, *today.*

METTLER

Eclipse

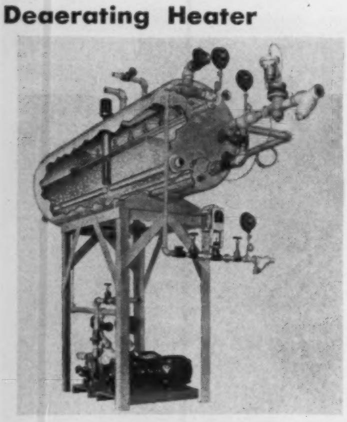
THE METTLER CO., INC.
Division of ECLIPSE FUEL ENGINEERING CO.
4366 WORTH ST., LOS ANGELES 63, CAL.

EQUIPMENT DEVELOPMENTS

Continued

or with casement windows, the company says. Carrier Corp., 300 S. Geddes St., Syracuse 1.

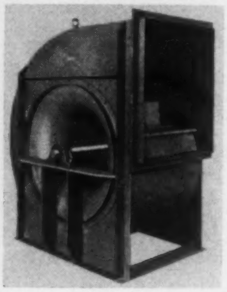
Deaerating Heater



A new design deaerating heater, said to be capable of reducing oxygen content in boiler feed water down to 0.03 cc per liter, features "floating" temperature control at 211 F through one or more internal nonferrous steam distributing tubes, the manufacturer reports. This control is by means of a sensitive combination temperature and pressure regulator which is responsive to a 1/4 deg change at the bulb, the company says.

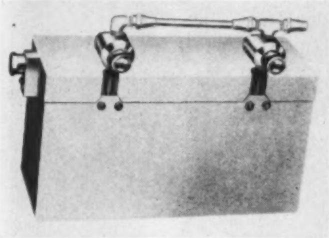
Sizes are available to handle loads to 1000 hp or 30,000 lb per hr, according to the manufacturer. Fred H. Schaub Engineering Co., 2110 S. Marshall Blvd., Chicago 23.

Standard Duty Fan



Design features of the standard duty fan shown are as follows, according to the company: All welded wheel with spun front plate and hub, scroll designed for proper pressure conversion within fan, spun inlet cone directs air to wheel at proper flow angle, heavily constructed housing, bearing platform braced for low vibration and solid bearing support, deliberately oversized shafting, lifting eyes for ease of installation and to prevent damage in handling, and all welded construction. New York Blower Co., 32nd St. and Shields Ave., Chicago 16.

Humidifying Unit

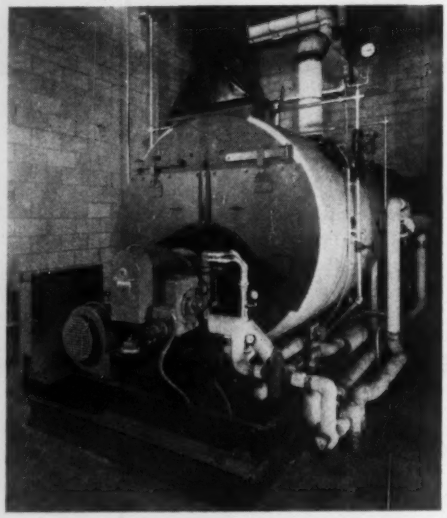


A new humidifier for use in smaller rooms and enclosures provides humidity adjustment for areas up to about 12,000 cu ft, the manufacturer reports. The unit consists of two humidifying nozzles and a water supply-tank with float valve. Accessory

FARRAR & TREFTS, Inc.

ESTABLISHED 1863

20 Milburn Street Buffalo 12, New York



3000 Series Package Boiler Installation
Sears, Roebuck Co., Buffalo, N. Y.

Streamline W Welded BISON BOILERS Streamline W Welded

FOR HEAT and POWER

Designed to produce maximum steam output in shortest time at minimum operating costs.

- Scotch Wet Back Package Unit Boilers
- Horizontal Return Tubular Boilers
- Locomotive Type Boilers
- Bison Two-Pass Refractory Lined Boilers
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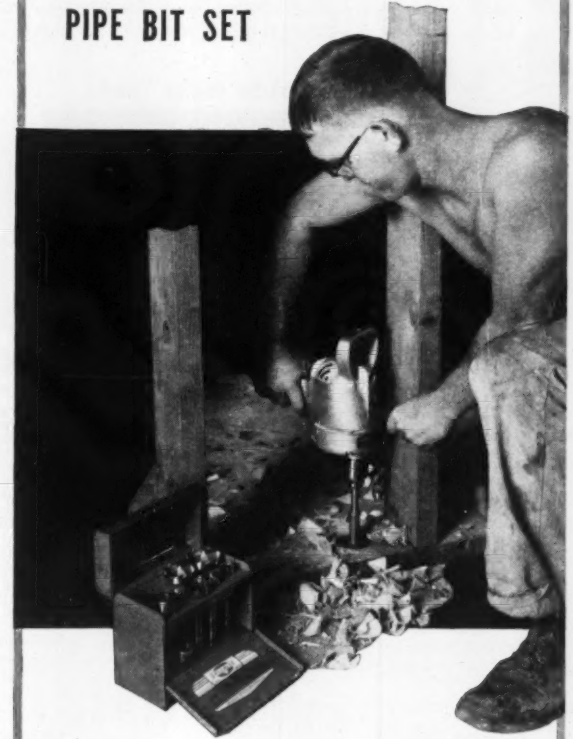
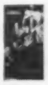
- Scotch Dry Back Power Boilers
- Utility Scotch Boilers
- Bison Compact Boilers
- Bison Firebox Boilers

ASME — API-ASME — LLOYDS
QUALITY BOILERS TO GIVE QUALITY SERVICE

QUICKLY BORE PIPE-SIZE HOLES IN WOOD WITH GREENLEE PIPE BIT SET

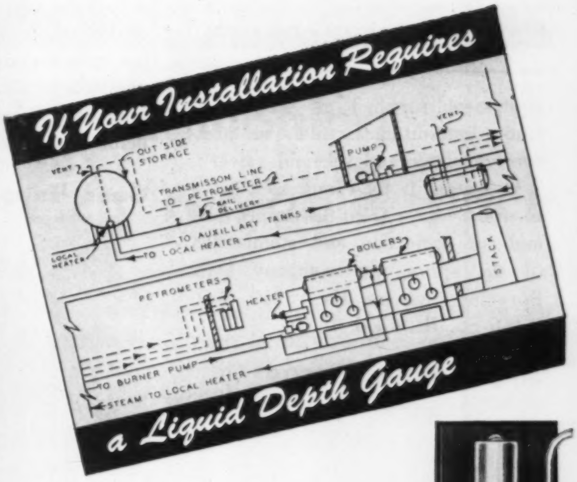


Make swift, easy work of an otherwise tedious, hard job. Quickly cut clean "tailor-made" openings for ½" to 2" pipe with the GREENLEE No. 1440 Pipe Bit Set. It is designed especially for plumbers, steamfitters, and electricians to provide fast, easy boring of *smooth* holes in wood — studding, floors, joists, etc. Bits are precision made and of highest quality for long life and clean, speedy boring. Made with ½" shanks with 3 flats for use in portable electric or pneumatic drills and in stationary boring machines. An adapter is provided in the set for using the bits with standard auger-bit braces. Set also includes electric drill adapter and coupling for using standard ⅜" pipe as an extension for deeper boring and longer reach. Set contains six bits for boring holes to accommodate the following pipe sizes: ½", ¾", 1", 1¼", 1½", 2". Bits, adapters, and coupling packed in an attractive, sturdy metal box with convenient carrying handle. Write today for descriptive folder.



TOOLS FOR CRAFTSMEN
GREENLEE

Greenlee timesaving tools for plumbing and heating work: Hydraulic Pipe Pushers • Hydraulic Pipe Benders • Tubing Benders • Pipe Bits Auger Bits • Spiral Screw Drivers • Chisels • And many more Greenlee Tool Co., 2343 Twelfth Street, Rockford, Illinois.


If Your Installation Requires
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THE BEST GAUGE FOR:

Commercial and Industrial Fuel Oil Tanks

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Storage Tanks for other liquids—gasoline, solvents, acids, etc.

Here's Why:

No troublesome moving parts—operates on the sound principle of the U-tube. Simple, dependable and accurate.

Large, easy-to-read vertical scale gives tank contents at a glance. Eliminates the cumbersome measuring stick and the inconvenience of climbing the tank.

Installation is easy—gauges can be installed on tanks above or below ground level and up to ¼ of a mile away. The tank assembly for the gauge can be installed even when the tank contains liquid. It can also be fitted in the tank separately to complete the tank work. The gauge can be connected any time later. Just tighten one simple connection and the job is finished.

FOR TANKS 20 INCHES TO 50 FEET DEEP. ***Write for Bulletin PV.***

LIQUIDEPTH INDICATORS, INC.

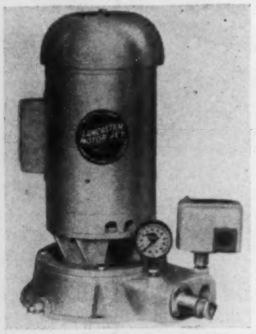
43-22 TENTH ST., LONG ISLAND CITY 1, N. Y.

EQUIPMENT DEVELOPMENTS
Continued

equipment supplied as needed includes humidistat, air filter, air pressure regulator and solenoid valve.

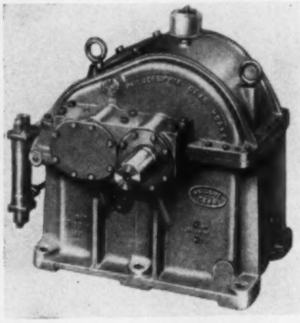
Operation is by compressed air—to siphon water from the supply tank and for projection and atomization of the spray, the company says. Spraying Systems Co., 3219 Randolph St., Bellwood, Ill.

Single Stage Pumps



A new series of vertical single stage pumps features an all brass, built in automatic control valve, and an all bronze impeller and injector, the manufacturer reports. Units are available in sizes from 1/3 to 5 hp. Lancaster Pump & Mfg. Co., Manheim Rd., Lancaster, Pa.

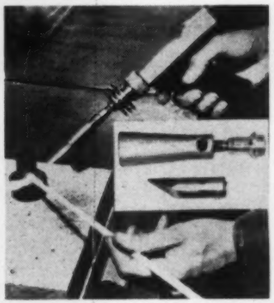
Gear Units



A new line of "Hi-Speed" gear units for speed reduction and increaser service have been designed to operate at rotating speeds up to 9000 rpm and pitch line velocities to 10,000 fpm, their manufacturer reports. Units are manufactured in 17 sizes for ratings up to 7100 hp and are available in ratios from 1-1 up to 10-1.

Gearing is of the double opposed helical type having teeth hobbed and shaved, says the company. Housings include oil reservoir, integral pump and coolant system with spray nozzles directed at the line of gear contact. Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia 34.

Portable Heat Tool



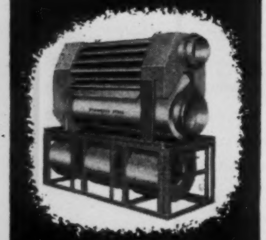
Designed for heating applications that are within or beyond the capacity of conventional blow torches or soldering irons, the "Fire Gun," a portable hand operated heat tool, burns clean, low cost propane with a heat range of 4000 to 117,000 Btu/hr, its manufacturer reports.

National Champion

SCORES A STRIKE EVERY TIME!

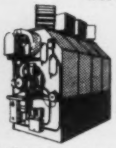
National Champion line of heaters solves your heating problem, with plenty to spare! Whatever your heating need—space heating, tempering make-up air, curing, drying or de-icing—there's a National Champion to do the job. Check these winning points:

- 80% guaranteed heating efficiency
- Direct fired for gas, oil or combination fuels
- Completely automatic controls — for constant, clean heat
- 70%-150% more heat transfer area than similar units
- Quieter, smoother operation — lowest blower RPM
- Highest available external static pressures
- Electronic flame failure control
- Completely wired, assembled and flame-tested at the factory to guarantee peak performance
- Listing by Underwriters' Laboratories, Inc.

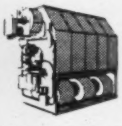


Teardrop design
Combustion Chamber
the "heart" of National
Champions

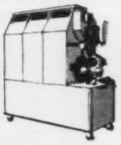
NATIONAL CHAMPION HEATERS—6 Models — 66 Sizes



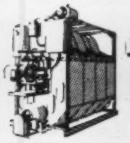
Model H—vertical unit with discharge heads. 12 sizes.



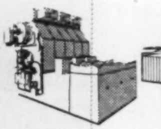
Model D—vertical unit for duct work. 12 sizes.



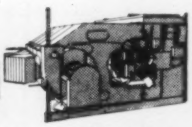
Model P—portable, vertical unit for flexible duty. 6 sizes.



Model R—inverted unit with discharge heads at bottom. 12 sizes.



Model S—vertical unit with side blowers to permit proper location of air mixing dampers. 12 sizes.



Model C—horizontal ceiling suspension unit for space saving. 12 sizes.

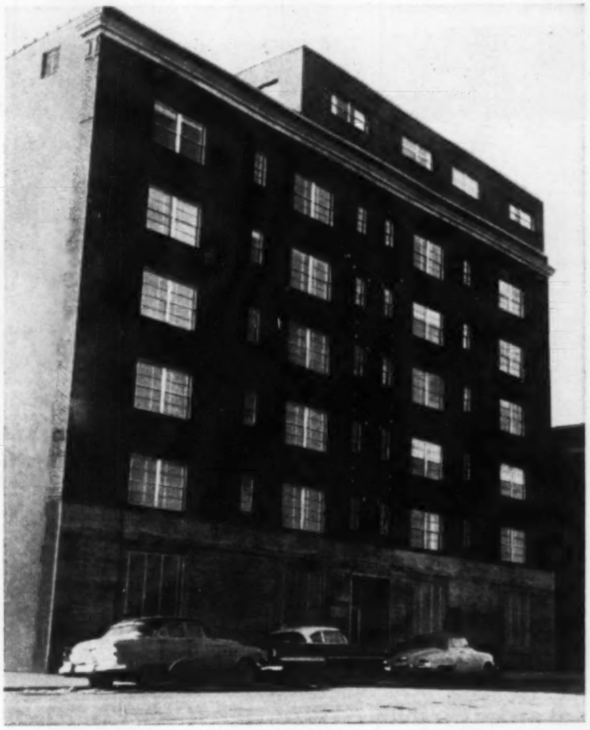
200,000 to 2,000,000 BTU CAPACITIES

Write today for complete information and specifications.

NATIONAL HEATER COMPANY, INC.
2180 Cleora Avenue, St. Paul 4, Minnesota

G.E. HAS THE ANSWER TO AIR CONDITIONING PROBLEMS IN ANY OFFICE, STORE, OR FACTORY

G-E packaged air conditioning enables architect to "stretch" rentable space



RULE BUILDING has eight G-E Packaged Air Conditioners connected to two forced-draft cooling towers in old elevator penthouse. Ripstra-Turner Company were the contractors for the conversion.

Putting air conditioning equipment in an existing building generally reduces net rentable floor space. However, when architect Robert Morris, of Wichita, Kan., finished converting the 7-story Rule Apartments to the Rule Office Building, he had actually *added* rentable space.

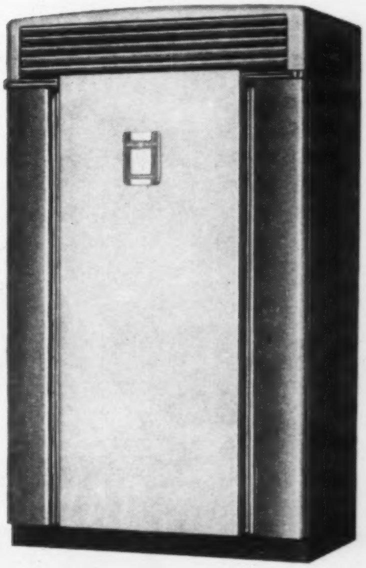
By putting 10-ton G-E Packaged Air Conditioners in small rooms formed by putting floors in old light courts, and a 7½-ton unit in the penthouse, he left the entire basement free for rental. Then, by equipping the packaged units with steam coils for winter heating, he gave each floor complete year-round control of its own "weather". By using the light courts, he was able to "stack" the units and save on piping.

He effected further savings by using overhead supply ducts. As a result, his clients got dependable, efficient year-round heating and cooling for only *87 cents per square foot.*

Write for complete architectural data.
General Electric Company,
Commercial & Industrial Air Conditioning Dept.,
5 Lawrence St., Bloomfield, New Jersey.

LOOK AT ALL THE ADVANTAGES OF USING G-E PACKAGED AIR CONDITIONERS FOR NEW AND REMODELLED BUILDINGS

- Low installation, low operating costs. Units come fully assembled.
- Give the architect maximum design freedom. Units can be used in space or concealed, with or without ducts. Simple connections.
- Streamlined cabinet styling that adds to the decor of any interior.
- 3, 5, 7½, 10, and 15 ton units can be used singly or in multiple installations to meet air conditioning needs of buildings of any size.
- Easily directed air flow for no-draft, no-waste air circulation.
- Muggy Weather Control removes excess moisture in any weather without over-chilling or clammy cooling. Simple damper control.
- Built and factory assembled by General Electric. 5-year warranty covers entire sealed cooling system, including freight and labor.



Packaged AIR CONDITIONERS

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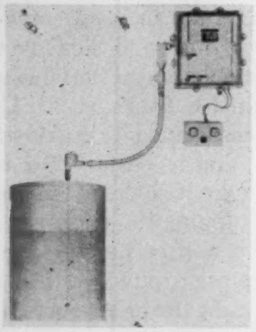
GENERAL ELECTRIC

Uses cited for this trigger controlled unit are soldering, tinning, brazing, preheating, thawing, plasticizing and paint removal. The basic kit includes the various tips required for particular jobs, hose, regulator, pressure gage, and steel carrying box. Fire Gun Sales Corp., 2500 W. 7th Ave., Denver 4.

Recorder-Controller



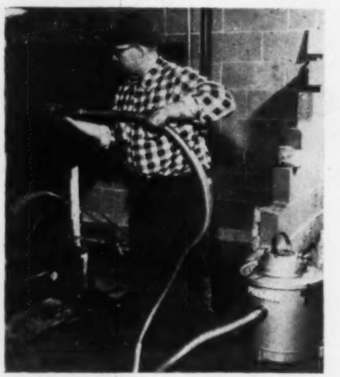
A self balance recorder-controller, designed to be very sensitive and highly accurate, is for use in the measurement and control of levels of liquids, granular solids, interface and other substances, its manufacturer announces.

Called the "Series 42 Radio Frequency Capacitance Bridge," the instrument may also be used for other process variables, such as moisture content or composition, which cause a direct change in dielectric constant, according to the company. Fielden Instrument Div., Robertshaw-Fulton Controls Co., 2920 N. 4th St., Philadelphia 33.

Cleaning Unit

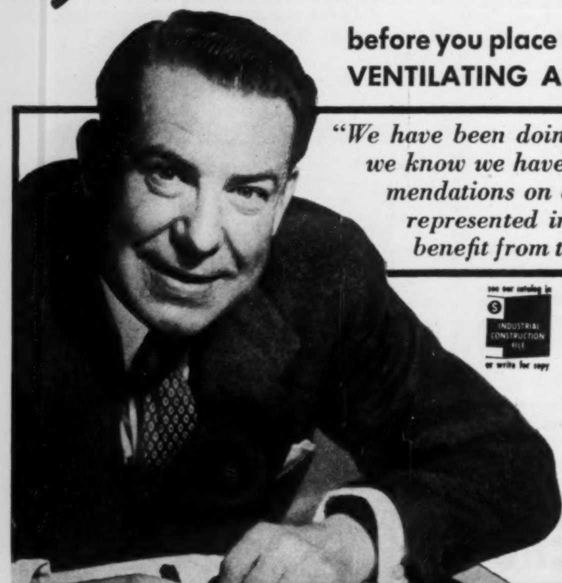
Large filter area allowing increased dirt capacity is a feature of a new portable heating and air conditioning system cleaner cited by its manufacturer.

Named "Spic-Span, Model 950H," the unit has a pleated filter designed to give more area than previous models with no overlapping or clogging, the company says. The filter also allows for cooler motor operation and higher cleaning efficiency, the manufacturer reports. The unit is powered by a $\frac{1}{2}$ hp, 600 watt input, 115 volt a-c/d-c motor. Included with the unit is a 30 ft rubber covered cord with a molded plug, flexible steel hose, crevice tool, reducer coupling, and fabric and throw away paper filter. Premier Co., 755 Woodlawn Ave., St. Paul.



Fan Blade Design

A new blade design has been incorporated on the manufacturer's plastic cooling tower and heating exchanger fans in 14 to 22 ft diameters, the company announces.



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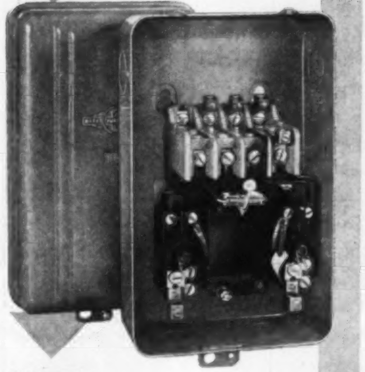

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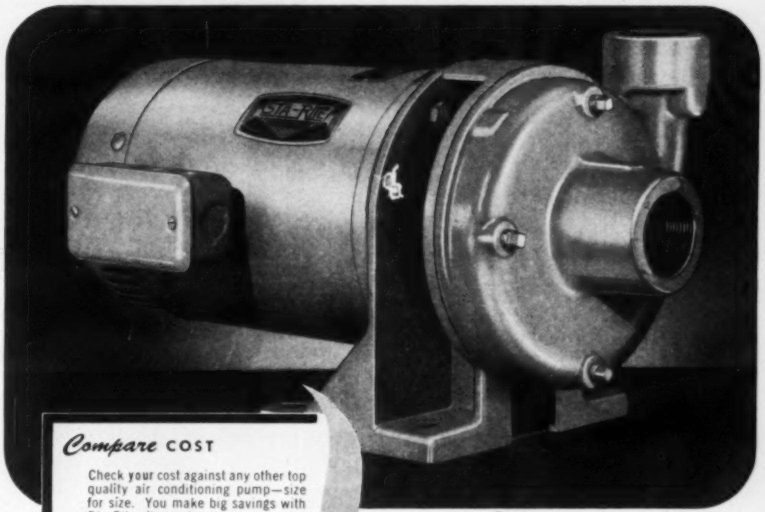

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Check your cost against any other top quality air conditioning pump—size for size. You make big savings with Sta-Rite discounts.

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Check TDH and efficiency, too. You get top hydraulic performance . . . more water with less power.

Compare EASE OF INSTALLATION

This pump is smaller, lighter in weight. Discharge outlet rotates to any of 4 positions. Mounting foot also rotates. Pump mounts at any angle for easy coupling and alignment.

Compare LONG LIFE

This trouble-free pump is constructed of top-quality materials, custom-engineered to assure long, dependable service. It eliminates service call backs, lets you keep your profits.

Yes, Compare and you'll buy STA-RITE

If you need small, lightweight pumps to fit modern, compact air conditioning equipment, check Sta-Rite. You can see pump superiority in the all-bronze closed impeller. And special 2-piece impeller construction assures friction-free channels, more capacity. Motors are full power, ball-bearing and capacitor-type, specially designed and made only for Sta-Rite pumps. Mechanical seal is positive, leak-proof. Single shaft is corrosion-resistant, requires no coupling, prevents alignment problems.

Ask your wholesaler, or write for his name and a copy of new bulletin describing Sta-Rite Air Conditioning Pumps.

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Los Angeles, Calif. • Chamblee, Ga.
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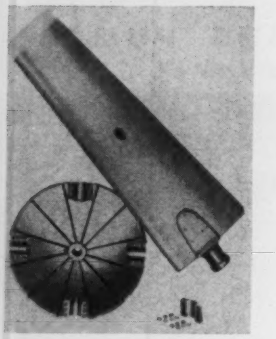
EQUIPMENT DEVELOPMENTS

Continued

The tapered blade is thicker at the shank than at the tip and has a reinforced leading edge to increase stiffness and reduce sag, according to the manufacturer. This built up edge also produces a tear drop cross section which smooths out air flow over the blades and produces increased air deliveries, says the company. Hartzell Propeller Fan Co., Piqua, Ohio.



Arc Welder

A new combination arc welder is said to provide the ideal type of welding arc for a particular type of manual welding application, permitting selection of either a-c or d-c and either a soft or forceful arc.

The unit can be obtained as an a-c welder to which a d-c package can be attached when needed, or as a combination machine with selection of either current made through a twist of a switch handle, the manufacturer reports.

A dual control of the voltage and amperage permits selection of the proper arc for a particular job, according to the company. The Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17.

Equipment Briefs . . .

VACUUM PUMP UNIT, called the "VacForm Mobile Pump Wagon," is housed in a protective metal cabinet with removable panels, mounted on a steel frame with a swing back top door opening, its manufacturer states. It has rubber tired ball bearing wheels to permit movement from place to place by one man, according to the manufacturer. Vacuum Forming Corp., Port Washington, N.Y.

LIQUID NEOPRENE COATING provides resistance to corrosion in the chemical, plating and other process industries, the company says. The coating is recommended for the protection of new or old equipment and structures and where chipping and abrasion due to rough handling make the use of ordinary paints impractical. Emjay Maintenance Engineers, 327 Union Ave., Rutherford, N.J.

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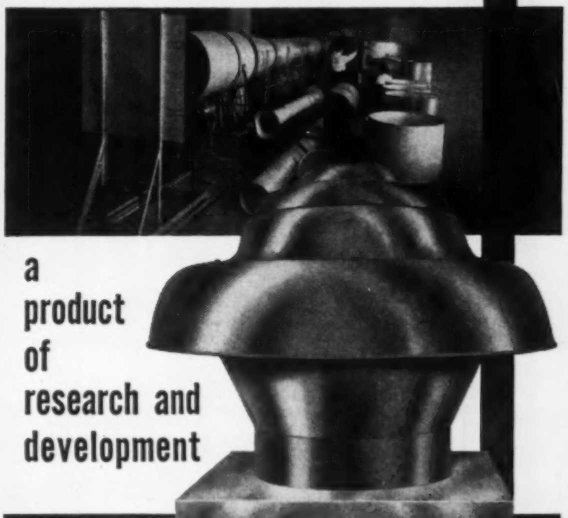

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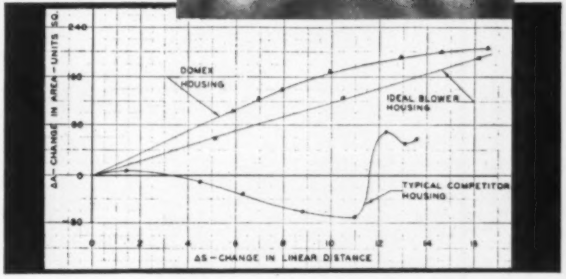

The design of any exhauster is of prime importance to its efficient performance. The graph above illustrates the perfectly designed centrifugal fan housing based on proportionally increasing discharge areas.

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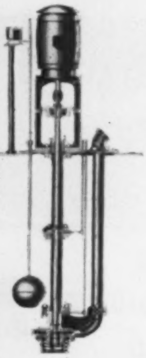
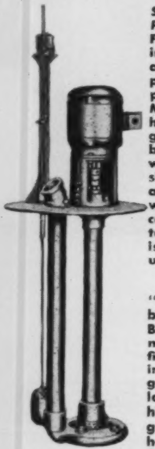


Series 3000 Bilge or Sump Pump for solids-free liquids from drainage and seepage, and industrial process wastes. LUBRI-VAC (R) System standard on all units increases normal life as much as 12 times, eliminates bearing scoring.

This heavy-duty wet pit pump is supplied as a complete unit including pump casing, impeller, shaft, suspension and discharge pipes, thrust-bearing and flexible coupling assembled on a suspension plate with a catch basin or sump cover, with motor and automatic control equipment. Normally furnished with standard float and stand, but special automatic controls supplied when specified. Gravity or forced feed automatic or non-automatic lubrication as required. Capacities from 15 to 1200 g p.m.; heads to 75 ft.



Series 3100 Bilge or Sump Pump — Top Suction Type. For homes, residential buildings, industrial plants, sewage and water treatment plants, recreation parks, pools and similar applications. Meets the need for a moderate price pump of heavy duty construction for capacities to 120 g.p.m. and heads to 46 ft. Designed and built to Yeomans strict engineering standards with self-adjusting flexible coupling, liberal size stainless steel true running shaft, renewable sleeve guide bearings and bronze impeller with large water passages, balanced hydraulically and mechanically. Duplex sets with interchanger which divides work between pumps is recommended for longer life and emergency use.

"Drain-Dri" Sump Pump for buildings and industrial use. Built like a heavy-duty Yeomans municipal pump. Hand finished, balanced, nonclogging impeller passes any trash which goes through the screen. Extra large stainless steel shaft is highly polished, turned and ground. Float switch actuated by heavy copper float with guided float rod. Large area, heavy cast iron screen. Permanently aligned, drip-proof, ball bearing motor 1750 r.p.m. 60 cycle or 1450 r.p.m. 50 cycle. Can be supplied with diving bell for rugged underground duty. Sump depths from 2 ft. to 10 ft. Capacities to 85 g.p.m.; heads to 28 ft.

Yeomans originated the Wet Pit Pump and the Yeomans name is your best guarantee of sound engineering, fine workmanship and rugged construction for continuous heavy duty work.

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RECENT TRADE LITERATURE...

▶ *ALUMINUM MILL PRODUCTS*—A new 16 page brochure describes the manufacturer's mill products and how to use them. A wrought aluminum alloy selection guide outlines the general properties of various products and lists their applications. A casting alloy selection guide also is included. Reynolds Metals Co., 2500 S. 3rd St., Louisville 1.

▶ *ARC WELDING*—Volume XI, No. 4, "Hobart Arc Welding News," is a 16 page booklet containing illustrated articles on welding done in specific installations. Hobart Bros. Co., Hobart Sq., Troy, Ohio.

▶ *CENTRIFUGAL PUMPS*—Bulletin 722.6 on the manufacturer's "Fig. 3305" two stage centrifugal pumps with horizontally split case and opposed impellers gives information on specifications, materials of construction and mechanical details. Performance curves and charts showing parts interchangeability are included. Goulds Pumps, Inc., Fall St., Seneca Falls, N.Y.

▶ *CENTRIFUGAL PUMPS*—A 4 page bulletin describes the manufacturer's centrifugal type "AC" air conditioning pumps, designed to cut installation and maintenance costs. Units have capacities to 70 gpm, heads to 115 ft and hp from 1/4 to 1 1/2, the company says. Sta-Rite Products, Inc., Delavan, Wis.

▶ *CENTRIFUGAL PUMPS*—Bulletin No. W-306-B3B lists in table form a wide selection of centrifugal pumps for use in air conditioning systems, their ratings and capacities for approximate refrigeration tonnages. A chart provides information on net dealer prices, horsepower, weight and pump sizes and types. Worthington Corp., Harrison, N. J.

▶ *CHEMICAL FEED SYSTEMS*—A 4 page folder, catalog No. LP-1254, illustrates, describes, and has an application chart for the company's chemical feed packaged units equipped with "Simplex" or "Duplex" pumps. Philadelphia Pump and Machinery Co., Inc., 1513 Race St., Philadelphia.

▶ *CLOSED CELL SPONGE RUBBER*—The manufacturer's brochure illustrates "ARco-Cel" closed cell sponge rubber, designed to be moistureproof, soft, shock absorbent, and light in weight. The material has a variety of applications in the air conditioning and allied fields, the company states. Automotive Rubber Co., Inc., 12550 Beech Rd., Detroit 39.

▶ *COMPRESSORS*—Location, foundation shaking forces, soil considerations, foundation suggestions, location of inter and aftercoolers and receivers, tem-

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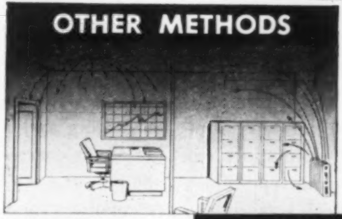

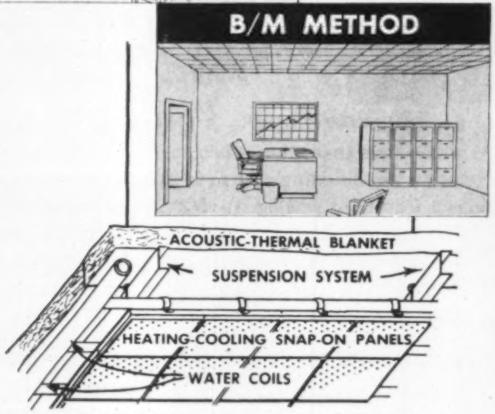

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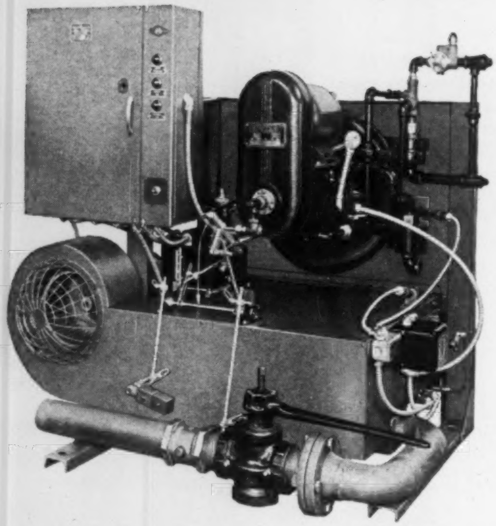

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RECENT TRADE LITERATURE

Continued

peratures, lubrication, inspection and maintenance information are topics covered in an article entitled "Non-Portable Compressors—an installation and maintenance guide," by H. W. Whiting of Worthington Corp., Harrison, N. J.

▶ *CONDUITS FOR INSULATED PIPING*—Construction features of the manufacturer's standard tile conduit for use under ordinary ground loads and ground conditions, and arch tile conduit for special ground and project conditions are presented in the manufacturer's 4 page folder, bulletin No. 101. Universal Sewer Pipe Corp., Steam Conduit Div., 1500 Union Commerce Bldg., Cleveland 14.

▶ *CONTROLS*—Newest literature from the manufacturer discusses his line of controls for heating and air conditioning systems, outdoor reset hot water controls, controls for classroom type unit ventilators, and water chiller control. Check lists giving code numbers for literature on particular units are available from the company. Barber-Colman Co., 1228 Rock St., Rockford, Ill.

▶ *COOLING TOWERS*—A formula for estimating the water costs that occur when the discharge water from an air conditioning system is dumped down the drain is a feature of catalog No. 800, a new 8 page bulletin. The catalog illustrates and explains the construction and operation of towers in the capacity range of 15 through 100 tons. Acme Industries, Inc., Jackson, Mich.

▶ *COOLING TOWERS*—Bulletin 477 features new additions to the company's "3-B" series cooling tower line. They are multiple blower tower assemblies with individual motor drives. Cooling Equipment Div., Binks Mfg. Co., 3122 Carroll Ave., Chicago 12.

▶ *COOLING TOWERS*—A 4 page bulletin covers the company's "LoLine" cooling tower for air conditioning use. A description of this tower is in the Equipment Developments section of this issue. J. F. Pritchard & Co. of California, 4625 Roanoke Pkwy., Kansas City 12, Mo.

▶ *COOLING TOWERS*—15 questions about induced draft cooling towers and their answers are contained in a 30 page brochure. Materials, construction details, structural features, factors in selection, and location are included. J. F. Pritchard & Co. of California, 4625 Roanoke Pkwy, Kansas City 12, Mo.

▶ *DEAERATORS AND WATER SOFTENERS*—Booklets 402 and 801 discuss the manufacturer's lines of tray deaerators and hot process water softeners. American Water Softener Co., Inc., 4th St. and Lehigh Ave., Philadelphia 33.

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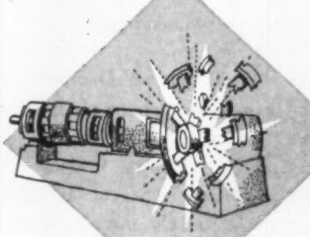

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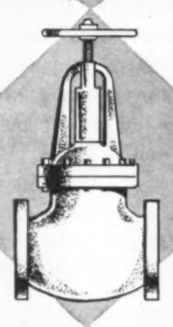

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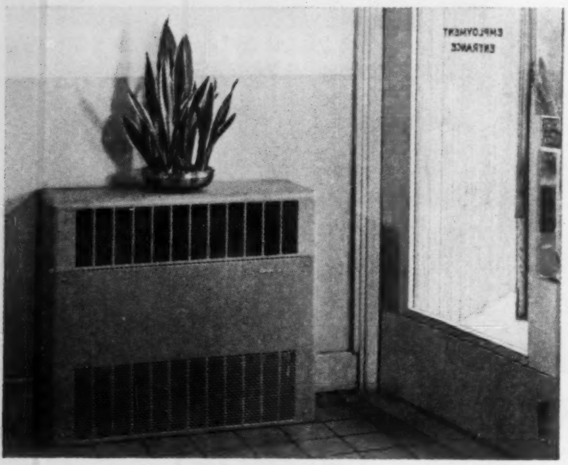

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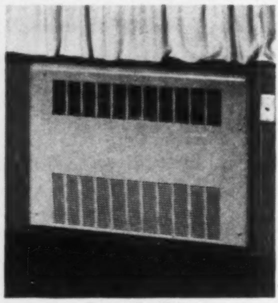

Recessed model

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RECENT TRADE LITERATURE

Continued

▶ *DEALKALIZING SALT SPLITTER*—Publication No. 4567 on the manufacturer's dealkalizing salt splitter discusses the process of chloride anion exchange, why it is necessary to dealkalize water for boiler feed and processing, and shows how water can be dealkalized with the company's equipment. Cochrane Corp., 3131 N. 17th St., Philadelphia 32.

▶ *DEMINERALIZING*—"Handbook on Demineralizing," a 40 page booklet, compares various methods of water treatment, as well as indicate the comparison between demineralizers and evaporators. It goes into the characteristics of the various types of available cation and anion exchange materials and offers data on operating costs of demineralizing. Cochrane Corp., 3131 N. 17th St., Philadelphia 32.

▶ *DIAPHRAGM CONTROL VALVES*—Bulletin 5304 discusses the manufacturer's single seated diaphragm control valves. Units are in three basic types; unbalanced tight shutoff, balanced tight shutoff and balanced high pressure drop. Leslie Co., 237 Grant Ave., Lynhurst, N.J.

▶ *DIFFUSERS AND GRILLES*—The manufacturer's three new 4 page catalogs contain information as follows: No. ECCO-103, ceiling air supply outlets designed for evaporative cooling systems; No. FB-104, forced air heating registers and grilles; and No. VC-105, air volume controls and dampers. Air-Factors, Inc., 1624 S. Raymond Ave., Monrovia, Calif.

▶ *FABRICATED STAINLESS TUBING*—A new 36 page catalog on fabricating and working stainless tubing and pipe describes each of 11 types of fabrication separately, with drawings and photographs augmenting the information. Carpenter Steel Co., Alloy Tube Div., Union, N.J.

▶ *FANS*—Details on cooling tower and heat exchanger fans are included in bulletin A-111A. Among the features are specifications and construction details on a new tapered blade design. Hartzell Propeller Fan Co., Piqua, Ohio.

▶ *FILTER MEDIA*—Performance data on porous "Teflon" filter media, information on complete filter units using this fluorocarbon material, are contained in bulletin T-115. Data on "Controlled-Pore Size" filter cloth for corrosive liquid and gas filtration is compiled in bulletin T-112. Porous Plastic Filter Co., 30 Sea Cliff Ave., Glen Cove, N. Y.

▶ *FITTINGS*—Bulletin U-1 describes the company's new forged steel unions in sizes $\frac{1}{8}$ to 2 in. in 3000

DO YOU HAVE A TWO-STAGE PRESSURE OR TEMPERATURE CONTROL PROBLEM

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Mercoid DA-400 Series Controls are dual purpose controls (available for pressure or temperature) incorporating a single element operating two separate independently adjustable Mercoid magnetic mercury switches. Circuit arrangements can be supplied for various operations, a few examples are:

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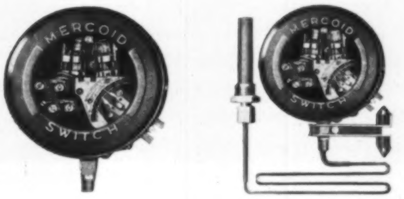
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Pressure types available in 17 different operating ranges from 0-30" vac. to 300-2500 psi. *Temperature types* available in 11 operating ranges from -30-60°F. to 370-530°F.

All types are equipped with external adjustments and visible calibrated dial.

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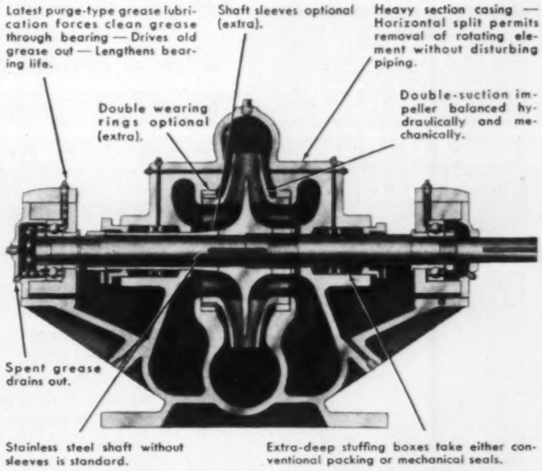
Latest purge-type grease lubrication forces clean grease through bearing — Drives old grease out — Lengthens bearing life.
Shaft sleeves optional (extra).
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Double wearing rings optional (extra).
Double-suction impeller balanced hydraulically and mechanically.
Spent grease drains out.
Stainless steel shaft without sleeves is standard.
Extra-deep stuffing boxes take either conventional packing or mechanical seals.

New Purge-type Grease Lubrication

CUTS PUMPING COSTS

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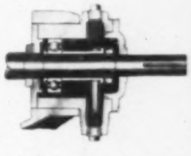
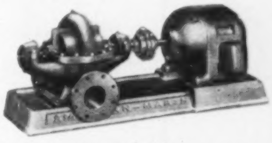
What does Purge-type Grease Lubrication offer you? Just this: By pushing out spent or dirty grease every time bearing is lubricated, it adds years of extra bearing service. That means less maintenance and longer pumping service from your total investment.



Ring-oiling ball bearings are also available (optional).

Many other superbly engineered features combine to eliminate interruptions and cut costs for A-M owners. Study the drawing a moment — You'll notice extra deep stuffing boxes and other details that are better designed, better built than ordinary pumps.

Then write for new HLM-HIM Bulletin 350, with full details and performance data.



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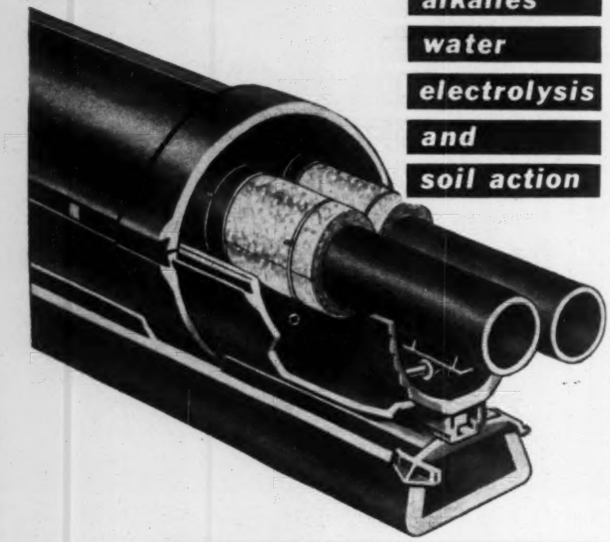

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RECENT TRADE LITERATURE

Continued

lb class. Mrs. Wilma Newton, Watson-Stillman Fittings Div., H. K. Porter Co., Inc., P.O. Box 95, Roselle, N.J.

▶ *FUEL COSTS CALCULATOR*—A pocket sized "slide rule" type calculator showing comparative fuel costs of coal, gas and oil is available from the company for 25¢. Cleaver-Brooks Co., Hev-E-Oil Burner Div., 326 E. Keefe Ave., Milwaukee 12.

▶ *GLASS BLOCK*—Functions of a new glass block designed for use in areas with severe sun conditions are described in the manufacturer's 4 page bulletin. Kimble Glass Co., subsidiary of Owens-Illinois Glass Co., Toledo 1.

▶ *GLASS BLOCK*—"Suntrol Glass Block for Reduction of Glare and Heat" is an 8 page booklet showing the physical performance of the new glass block and illustrating its pale green diffusing screen that helps to reduce the intensity of glare and heat. Pittsburgh Corning Corp., 1 Gateway Center, Pittsburgh 22.

▶ *HEAT EXCHANGER*—Bulletin 124 explains how the manufacturer's "Aero" heat exchanger applies to controlled temperature cooling of water, oil and other liquids and gases in a variety of industries. Niagara Blower Co., 405 Lexington Ave., New York 17.

▶ *HUMIDITY CONDITIONING*—Bulletin K-354 presents methods for eliminating condensation and resultant equipment corrosion in filtration plant pipe galleries and wash water pump rooms. Kathabar Div., Surface Combustion Corp., Toledo 1.

▶ *LIQUID CHILLER*—Catalog No. 600 lists 97 sizes and capacities ranging from 5 through 300 tons of the manufacturer's "Dry-Ex" liquid chillers. Specifications and a selection procedure are included. Acme Industries, Inc., Jackson, Mich.

▶ *MULTIPLE BOILERS*—A 6 page folder describes and gives capacity ratings and other specifications for the company's gas fired hot water or steam multiple boilers for commercial and industrial installations. Richmond Radiator Co., 16 Pearl St., Metuchen, N.J.

▶ *NOISE PROBLEM IN AIR CONDITIONING*—How to fit the manufacturer's "Aircoustat" sound trap built around a system of "Soundstream" absorbers, to cut down noise in air conditioning is discussed in the company's 16 page brochure. Charts demonstrate the noise attenuation characteristics of various "Aircoustat" types. Industrial Sound Control, Inc., 45 Granby St., Hartford, Conn.

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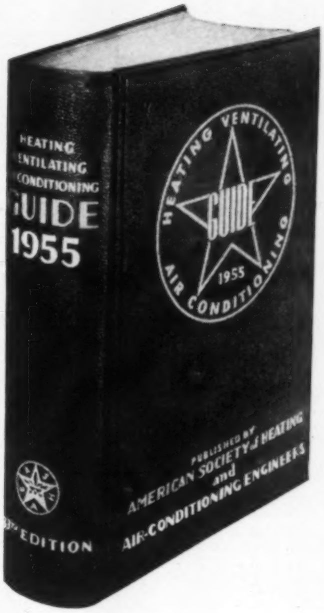

Published by the AMERICAN SOCIETY of HEATING and AIR-CONDITIONING ENGINEERS this indispensable book is revised and edited each year to make it the most demanded volume on heating, ventilating and air conditioning. THE GUIDE 1955 is a must for your office.

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The new, enlarged GUIDE 1955 is a source of accurate heating, ventilating and air conditioning technical information for daily usage by engineers, contractors, dealers and manufacturers. Each of the 53 chapters contains a detailed and exhaustive discussion and these chapters are divided into 7 sections for easier reference. In addition there is a Catalog Data Section containing product information on over 325 manufacturers.

Helpful To Many

The contractor planning or estimating a heating or air conditioning installation, the engineer in need of technical data while designing and specifying for an installation, and the manufacturer urgently in need of particular information will find that THE GUIDE can provide the answers quickly and concisely.

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7 sections covering Fundamentals; Human Reactions; Heating and Cooling Loads; Combustion and Consumption of Fuels; Systems and Equipment; Special Systems; Instruments and Codes. Section IV, for example, contains 5 chapters: Fuels and Combustion; Automatic Fuel Burning Equipment; Heating Boilers; Furnaces; Space Heaters; Chimneys and Draft Calculations; Estimating Fuel Consumption for Space Heating.

If You Need To Know

About heating load calculations there is a chapter covering this which includes heat loss coefficients, tables and formulas as well as data on edge loss from floor slabs. Likewise there is a chapter on cooling load calculations with design tables for solar heat gain through roofs, windows, glass block and figured rolled glass; also effects of shading devices. And if you need information on design methods for steam, water, vapor, vacuum, panel, warm air and air conditioning systems a chapter covers these topics as well as many others.

HP

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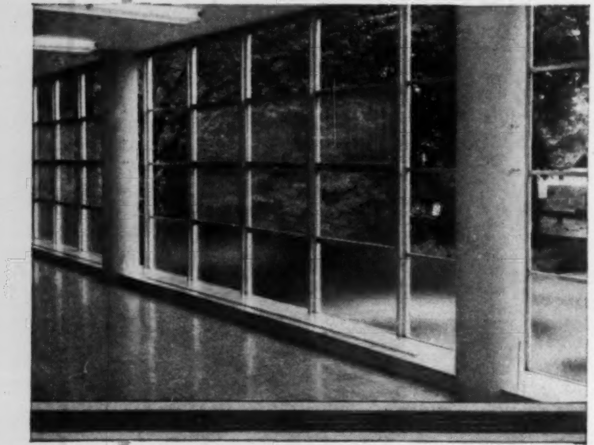

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BLEND IT . . . specify AGITAIR STRIPLINE as a continuous decorative unit, or in sections to meet any requirements of interior treatment.

HIDE IT . . . in shallow lighting coves for perfect concealment.

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RECENT TRADE LITERATURE *Continued*

▶ *O-RINGS*—No. AD-148, a catalog describing the manufacturer's O-rings, gives design information and recommended pressures for both dynamic and static applications. A complete list of ring sizes is contained. The Garlock Co., 50 Main St., Palmyra, N.Y.

▶ *PANEL HEATING*—A 24 page application book, prepared to assist in the design, layout and installation of radiant panel heating systems with the manufacturer's preformed panel grids, is a compilation of suggestions for planning and installation. American Brass Co., 414 Meadow Ave., Waterbury 20, Conn.

▶ *PIPELINE TECHNIQUES*—"Products Automatically Blended In Line," a reprint of an article by Paul Reed and R. G. Deering, contains schematic flow diagrams and photographs of the installation of a pipeline of the Shell Oil Co. Proportioneers, Inc., Div. of B-I-F Industries, Inc., Providence 1.

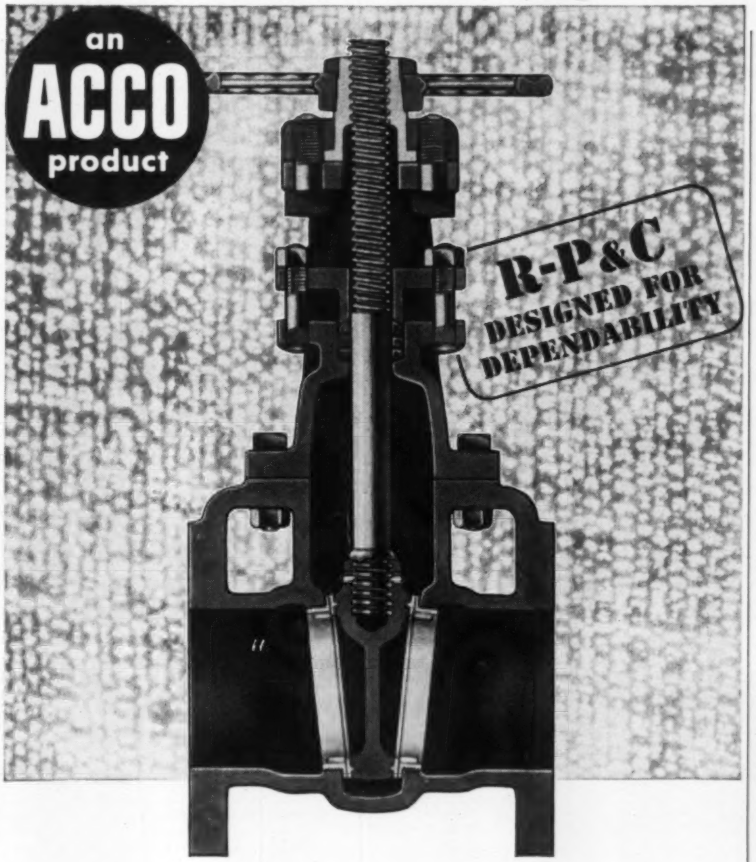
▶ *PLASTIC PIPE, FITTINGS*—How to use and specify rigid plastic pipe and fittings is the subject of a new 12 page catalog of a standard line offered to design, maintenance and application engineers, by Alpha Plastics, Inc., 14 Northfield Rd., West Orange, N.J.

▶ *POWER OPERATORS*—Bulletin B-50-2 is a 12 page booklet describing the company's "Cylinder Conomotor," a pneumatically positioned power operator for throttling control service. The bulletin illustrates the unit's many applications including proportional control of speed changers, valves, pumps and electrical components. Conoflow Corp., 2100 Arch St., Philadelphia 3.

▶ *REFRIGERATION*—Bulletin No. 195-C lists the manufacturer's complete line of equipment and services. Frick Co., Waynesboro, Pa.

▶ *REFRIGERATION PRODUCTS*—A new catalog for 1955 lists the company's complete line, including copper dryers, strainers, oil separators, capillary tubes, and refrigeration parts. A list price sheet accompanies the catalog. Wabash Corp., 2300-18 S. Western Ave., Chicago 8.

▶ *RELAY SELECTION*—The manufacturer's new bulletin on relay selection tabulations evaluates the factors in proper choosing. Circuit diagrams for two wire control, stop-start three wire maintained control, and thermostatic control for magnetically held relays are supplied. Automatic Switch Co., 391 Lakeside Ave., Orange, N.J.



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In addition, Elgen Silent Duct is a standard, machine-made product... uniformly strong from end to end... abolishes the imperfections and uneven workmanship in connectors produced under varying shop conditions. And Elgen Silent Duct costs contractors only about half as much as attaching material to metal in their own shops.

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RECENT TRADE LITERATURE

Continued

▶ *REMOTE TRANSMISSION*—A new bulletin introduces the manufacturer's "Telestep" remote transmission systems for water, sewage and process plant uses. Five basic models are reviewed. Automatic Control Co., 1005 University Ave., St. Paul 4.

▶ *REVOLVING DOORS*—A catalog, containing basic facts, figures and planning data on new developments in building entrances, features a description of air control, heat and cooling savings achieved by installation of revolving doors. International Steel Co., 1545 Edgar St., Evansville.

▶ *SEA WATER CONDENSER*—The company's double tube, counter flow sea water condenser is described in a 2 page bulletin. The units are made with cupro-nickel water tubes and naval brass headers, and are for marine use and other "bad water" conditions. Bulletin C-4, Halstead & Mitchell, Bessemer Bldg., Pittsburgh.

▶ *SHUTOFF VALVES*—New features incorporated into the manufacturer's "lock-tite" safety shutoff valves are described in bulletin M-302. Eclipse Fuel Engineering Co., 1139 Buchanan St., Rockford, Ill.

▶ *SOUND CONTROL*—Various "Fiberglas" sound control products are discussed and specification data is given for each in the manufacturer's new 32 page brochure. Typical installations are illustrated. Owens-Corning Fiberglas Corp., Toledo 1.

▶ *SPRAY NOZZLES*—A reference work on decorative fountain nozzles is suggested by the manufacturer as a guide for those interested in combining the decorative function of fountains with that of low cost air conditioning water cooling. Sectional drawings of nozzle types and performance charts are included. Schutte and Koerting Co., Cornwells Heights, Bucks County, Pa.

▶ *STEEL SUPPLY STOCK LIST*—The manufacturer's 1954-55 stock list is divided into four sections; special metals, industrial supplies, prices and references and carbon steels. U. S. Steel Supply Div., 208 S. LaSalle St., Chicago 90.

▶ *TEST PLUG FOR STEAM TRAPS*—The "Vis-A-Plug" transparent test plug, designed to check steam

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Here are THREE IMPORTANT REASONS...

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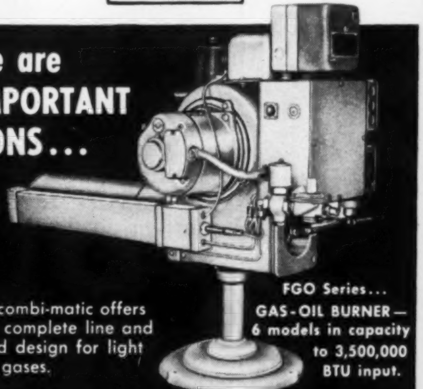

FGO Series... GAS-OIL BURNER—6 models in capacity to 3,500,000 BTU input.

① POWER combi-matic offers the most complete line and advanced design for light oils and gases.

② Now! controlled combustion on both gas and oil... with higher efficiency and lower operating costs.

③ Positive and complete *safety* with a *pre-purge* period in standard operating cycle.

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- Factory "FIRE-TESTING" insures... "on the job" performance.
- Automatic air adjustment... lets you set it—forget it.
- Electronic safeguard... responds immediately to flame interruption.
- Pressure safety control... prevents opening of either fuel valve unless air for combustion is proven.
- Optional automatic or manual changeover...
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- Less installation time.
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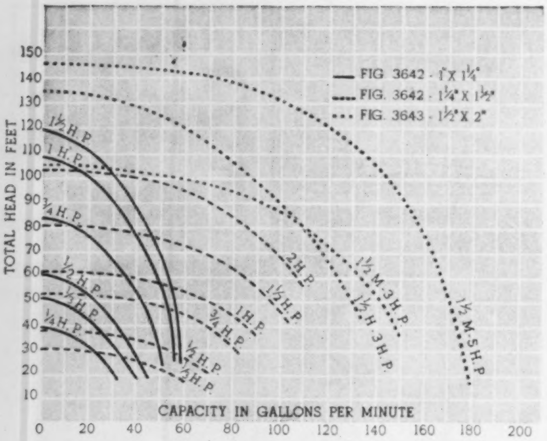
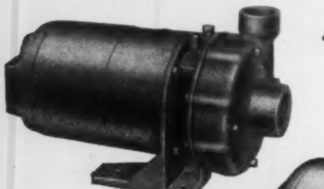


These curves can lead you to pumping economy

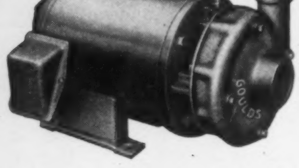
If your pumping needs fit on this chart, these pumps will save money for you. Here are capacities to 180 GPM, heads to 145 ft., in the performance ratings of this line of Goulds "close-cupld" centrifugal pumps, designed especially for air conditioning service.

They're economically priced. They're simple to install. Their compactness saves space, and the 8-position casing gives flexibility in locating the discharge.

Better still, their efficient performance, and their long, trouble-free service, will continue to save money for your customers for many years.



◀ Fig. 3642, 1" size with ¼, ⅓, ½, ¾, 1, or 1½ HP motor. 1¼" size with ⅓, ½, ¾, 1, 1½, or 2 HP motor.



▶ Fig. 3643, has 1½" discharge, available with 3 HP or 5 HP motor.

For additional details about these pumps, write for Bulletin 624.A-3.

Whatever your pumping requirements may be, there are Goulds pumps that will fill them economically and efficiently. We'll be glad to consult with you on any liquid-handling problem. Just write to Goulds Pumps, Inc., Seneca Falls, New York.

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RECENT TRADE LITERATURE

Continued

traps to 250 psi and 450 F, is presented in the manufacturer's leaflet. The R & R Co., P.O. Box 77, Sharon Hill, Pa.

▶ *THERMAL CONSERVATION*—Insulation solutions for temperature problems in various applications for specific insulation materials are contained in the manufacturer's 4 page bulletin. Mundet Cork Corp., Insulation Div., 7101 Tonnelle Ave., North Bergen, N.J.

▶ *UNDERGROUND PIPING CONDUIT*—Features of the company's conduit for underground pipe, designed to be permanent, economical, simple and efficient, are contained in a new 8 page brochure. H. W. Porter & Co., Inc., 825 Frelinghuysen Ave., Newark 5.

▶ *VALVE, FITTINGS*—Distributor's literature describes the "Boltaron 6200" polyvinyl chloride valve and fittings, including a valve manufactured by the Lunkenheimer Co., H. N. Hartwell & Son, Inc., Park Square Bldg., Boston.

▶ *VERTICAL PUMPS*—A new 16 page bulletin describes and illustrates the application of the manufacturer's vertical industrial service pumps for liquid transfer from short settings in both industrial and process services. Peerless Pump Div., Food Machinery and Chemical Corp., 301 W. Ave. 26, Los Angeles 31.

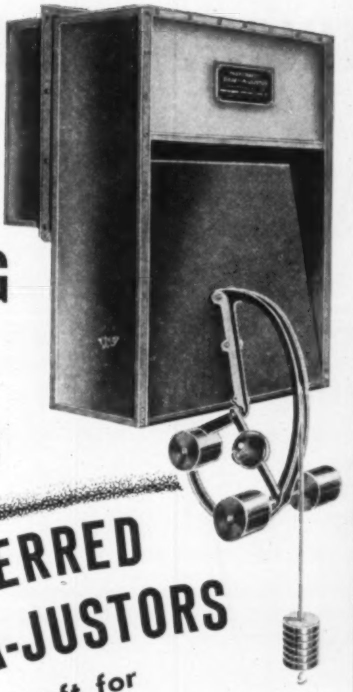
▶ *WATER COOLER*—A two page bulletin contains features, specifications and installation factors of the manufacturer's new recirculating water cooler for air conditioning and other industrial uses. Flight Mfg. Corp., 925 N. 8th St., Camden 2, N. J.

▶ *WATER HEATERS AND BOILERS CATALOG*—A gold embossed, leather bound, loose leaf catalog shows every size of water heater and heating boiler made by the company, giving complete specifications and trade prices for all sizes. Portmar Boiler Co., 193 7th St., Brooklyn 15.

▶ *WELDING FILLER CHART*—A new chart, keying the company's line of filler metals for welding, identifies each rod and electrode by the metal for which it is suited, forms available and methods with which it is used. Arcos Corp., 1500 S. 50th St., Philadelphia 43.

▶ *WROUGHT IRON*—Electrical conduit, radiant heated highway toll booths and snow melting systems are installations illustrated in the manufacturer's new 8 page booklet, "Wrought Iron for Highway Construction." A. M. Byers Co., Clark Bldg., Pittsburgh 22.

Convert Stack Losses into BIG Fuel Savings



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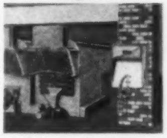
Constant Draft for Constant Operation

Easy to Mount and Adjust in Any Position

For that next boiler installation or in revamping an old heating job, be sure to include a Preferred Draft-A-Justor. Controls draft automatically and eliminates combustion efficiency losses due to excess air.

The Preferred is the only 100 percent statically balanced, barometric regulator and is sufficiently sensitive to maintain perfect draft control under all conditions and in all positions.



At base of chimney

At side of duct

COUNT THESE BLESSINGS

1. Saves from 10 to 30% in Fuel.
2. Insures Perfect Draft Control.
3. Cuts Heat Losses from Brickwork Leakage.
4. Increases CO_2 Percentage.
5. Reduces Quantity of Fly Ash up Stack.
6. Cools Hot Walls next to Chimney.
7. Ventilates Boiler Room.

Preferred Draft-A-Justors have saved millions of fuel dollars for thousands of users. Truly an investment that pays a 100 percent dividend every year.

There's a size to meet every condition. Approved by Underwriters' Laboratories, Inc.

Above breeching

Below breeching

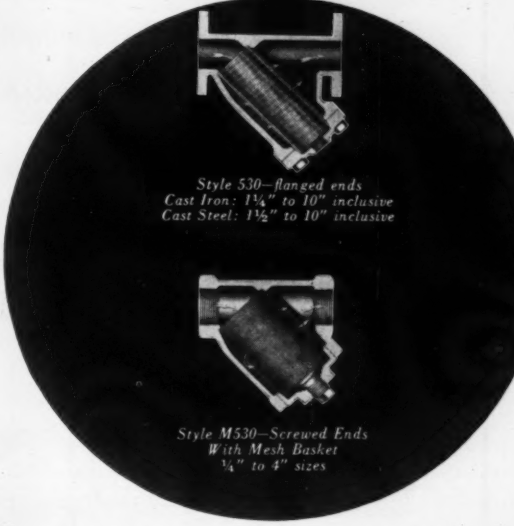
Write for Bulletin 800

PREFERRED UTILITIES MFG. CORP.
1860 BROADWAY Dept. HP-3 NEW YORK 23, N. Y.

YOU CAN DRAW A FINE LINE...

In the selection of protective strainer equipment for costly control and automatic trap installation ***McAlear offers the finest-widest line in the industrial field.***

Here's McAlear King Size Style 528 Strainer for hydraulic service . . . body, cast steel . . . 1200 lbs. working pressure . . . baskets, stainless steel . . . size, 24" . . . weight, 10,000 lbs.



Style 530—flanged ends
Cast Iron: 1¼" to 10" inclusive
Cast Steel: 1½" to 10" inclusive

Style M530—Screwed Ends
With Mesh Basket
¼" to 4" sizes

● McAlear strainers come in sizes ½" to 24" . . . . flanged or screwed bodies . . . clamp or bolted covers . . . . bodies of steel or special alloys and baskets of stainless steel, brass, or monel . . . to serve any installation.

McALEAR MANUFACTURING COMPANY
1901-1919 South Western Avenue
Chicago 8, Illinois

Phoenixspun FABRICATING...

METAL SPINNING
Up to 180" Diameter on World's Largest Horizontal Spindle Lathe

DEEP DRAWING
Up to 350 Tons

ASSEMBLING

FABRICATING
WELDING
Inert Gas, Arc, Oxyacetylene

Ask for Illustrated Bulletin — Send your Prints or Specifications for prompt quotations.

72" Dia. Steel Inlet Bell

Metal Spinning Div. PHOENIX PRODUCTS CO.
4707 N. 27th St., Milwaukee 16, Wis.

Handy Pump says:
"Pump liquid materials safely, efficiently, economically with BLACKMER HAND PUMPS"

Now you can get Blackmer quality in *both* rotary and piston type hand pumps

liquid materials handling ®
BLACKMER
Industrial, Hand and Truck Pumps, Strainers, Pressure Control Valves
BLACKMER PUMP COMPANY, GRAND RAPIDS 9, MICH.
DIVISION SALES OFFICES — NEW YORK • ATLANTA • CHICAGO
GRAND RAPIDS • DALLAS • WASHINGTON • SAN FRANCISCO
See Yellow pages for your local sales representative

WHO'S WHAT . . .

(New personnel, promotions)

▶ *SARCO CO., INC.*—With the retirement of Clement Wells, founder and president of Sarco Co., Inc. and Sarcotherm Controls, Inc., management and operation of the companies have passed on to the following: Directors are L. Barfus, H. F. Collins, R. W. Cumming, A. Milnes, J. Service and H. L. Simmons.

Sarco officers are: H. L. Simmons, president and treasurer; R. W. Cumming and A. Milnes, vice presidents; L. Barfus, assistant treasurer; and M. Mohr, secretary. Sarcotherm officers are: Mr. Barfus, president and treasurer; R. Stevens, vice president; Mr. Simmons, assistant treasurer; and F. Schneiderman, secretary.

▶ *GENERAL FITTINGS CO.*—John Belham, sales manager.

▶ *HEIL PROCESS EQUIPMENT CORP.*—Fred W. Arndt, chief engineer; Peter L. Veit, district sales engineer in New York.

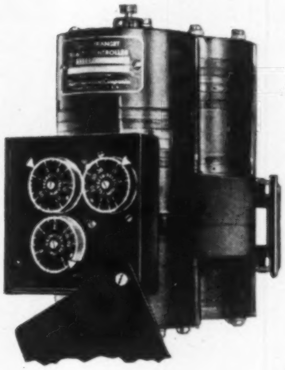
▶ *LAU BLOWER CO.*—John Burrowes, to work solely with the firm's sales representatives as chief engineer; William Wentling, chief project engineer in charge of all development and production work.

▶ *MORRISON PRODUCTS, INC.*—William H. Tonner, sales manager.

▶ *ORANGEBURG MFG. CO., INC.*—Frank P. Carlin, advertising manager.

▶ *PITTSBURGH CORNING CORP.*—Howard G. Jones, manager of building insulation sales. Mr. Jones succeeds Arnold I. Holmes, who has been appointed assistant to the general sales manager.

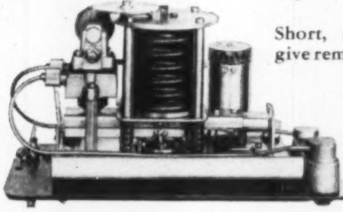
▶ *PRODUCER'S COUNCIL*—Newly elected officers: William Gillett, president; Fred W. Hauserman, first vice president; H. Dorn Stewart, second vice president; T. D. Wakefield, secretary; F. J. Close, treasurer.



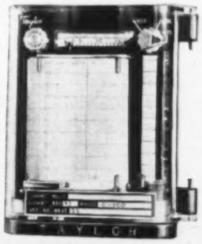
Announcing New Member of Taylor Transet* Team

THE new Taylor TRI-ACT* Controller, illustrated above, capitalizes on the fast speed of response of TRANSAIRE* measuring elements to give you unprecedented quality in the control of air temperatures. This unique force-balance controller combines all three response adjustments—gain, reset rate and PRE-ACT* response. It provides: 1. Faster recovery on load changes. 2. Start-up with no over-peaking. 3. Benefits of automatic reset without its evils.

Easy to align; Settings "stay put"—no one adjustment affects any other; practically insensitive to air supply variations, wide range of settings in sensitivity (gain) and Pre-Act time (derivative) without upsetting stability; excellent temperature compensation. Ask your Taylor Field Engineer, and write for **Bulletin 98097.** Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.



Taylor TRANSAIRE Temperature Transmitter
Short, shiftable range spans give remarkable accuracy—½% of range span on critical applications. Force-balance action. It transmits temperatures as far as 1,000 ft. from control panel.

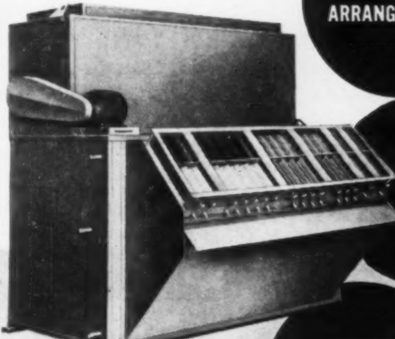


Taylor TRANSET Recording Receiver
Has automatic-manual unit, remote set-point indicator. 30-day linear chart, 3 hours visible. Chart reads from left to right on rectilinear coordinates, as an engineer would normally plot variables for study.

*Trade Mark

Taylor Instruments
MEAN ACCURACY FIRST

Only the d-h *Flexazone* Central-Plant Air Conditioner Gives you

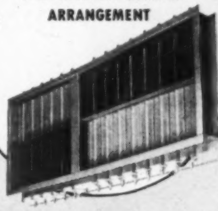


24 ARRANGEMENTS!

ZONES EASILY FIELD ALTERED!

HORIZONTAL OR VERTICAL DISCHARGE!

PLUS
D-H EXCLUSIVE DAMPER ARRANGEMENT



Gives independent, variable control for as many as 7 separate zones

Flexibility—that's the *extra* you get with Flexazone! Only Flexazone can be assembled 24 different ways, depending upon available space—*in the field.* Only Flexazone allows you to add or change zones at any time—*in the field.* And only Flexazone gives you a choice of horizontal or angular air flow from the plenum. These *exclusive* features pay off in cheaper installation, greater design-freedom and lower costs—important benefits, whether you're a contractor, architect, engineer, or building owner!

Want to learn more about Flexazone? Write for bulletin C-4.22.

d-h SINCE 1910
drayer-hanson
INCORPORATED
3301 MEDFORD STREET, LOS ANGELES 63, CALIFORNIA

WHO'S WHAT

Continued

▶ *BABCOCK & WILCOX CO.*—Laurence W. Hayward, manager of the Boiler Div.'s new contract and erection department. This department has been formed to consolidate the contract and erection phases of the division's operations.

▶ *NATIONAL SUPPLY CO.*—John C. Madden, assistant district manager of the New York office of the company's Spang-Chalfant Div.

▶ *AMERICAN INSTITUTE OF CONDUCTIVE GLASS*—Leon Appleman, chosen head of the organization which will undertake to promote electric heating. Mr. Appleman is president of the Electriglas Corp.

▶ *IRON FIREMAN MFG. CO.*—J. C. Veltman, manager of branch sales. Previously sales manager of the company's Chicago branch, Mr. Veltman has been with Iron Fireman for 26 years.

▶ *NATIONAL VULCANIZED FIBRE CO.*—Roy S. Fisher, national sales manager. Mr. Fisher was formerly branch manager of the Cleveland, Pittsburgh, Cincinnati territory.

▶ *WALTER KIDDE NUCLEAR LABORATORIES, INC.*—Dr. Joseph Silverman, head of the research department, Laboratory Div. The company is an organization engaged in research, development and experimentation for the design of nuclear power plants and the application of nuclear technology to industrial problems.

▶ *CARRIER CORP.*—Russell Gray, a vice president. Mr. Gray is assistant general manager of Carrier's Unitary Equipment Div., a position he will continue to fill.

▶ *REFRIGERATION ENGINEERING, INC.*—Harry L. Quinn, returned as eastern division sales manager after an absence of three years.

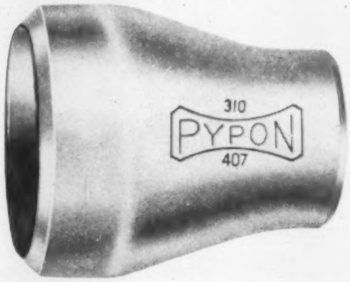
▶ *WESTINGHOUSE ELECTRIC CORP.*—Frank R. Benedict, manufacturing engineering manager for the Sturtevant Div. Mr. Benedict will supervise the operating methods, tooling and processes of manufacturing as well as coordinate the functions of engineering for the division.

▶ *UNION ASBESTOS & RUBBER CO.*—Frank D. Klein, manager of distributor development of the company's Heating and Cooling Div.

PYPON

Stainless Pipe, Tubing, Welding Fittings

Our reputation as a business is built on ability to serve the requirements of piping engineers and contractors. We are growing because of that service . . . performed on time. All or any of your specialty piping needs can be handled without difficulty by specifying PYPON Stainless Steel Welding Fittings and Stainless Welded Pipe.

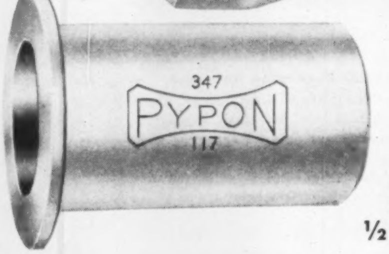


▶ ▶ ▶
Reducers
1" to 12"

347
PYPON
272

◀ ◀ ◀
90° Elbow
NOMINAL PIPE
SIZES ½" to 24"

Pipe and Fittings are available in stainless types 304, 304-L, 316, 316-L, 347, and are made in schedules 10, 40, 80, 160.



◀ ◀ ◀
Stub End
½" to 24"

SEND TODAY FOR CATALOG 53

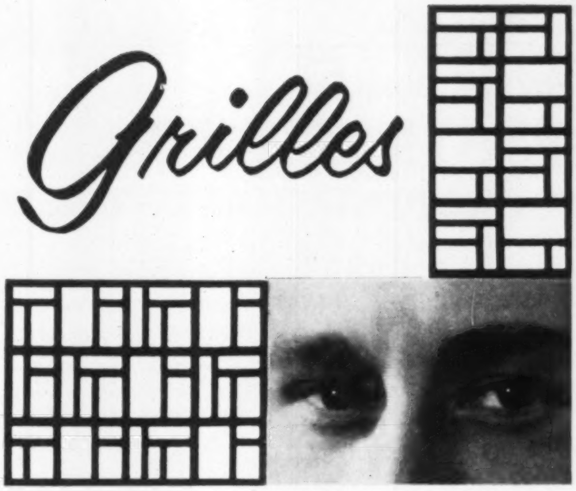
Caps ▶ ▶ ▶
½" to 24"

304
PYPON
465

The PYPON *Company*

FRICK BUILDING **PITTSBURGH, PA.**

Grilles



for that

distinctive look

Just as eye-appealing as they are functional, Hendrick Perforated Metal Grilles will greatly enhance the beauty of your decorative motif.

They provide more-than-ample open area for the free passage of air, and are available in a wide variety of designs to best set off your decor. And they're easy to install because of a special flattening operation in their manufacture.

Over one hundred basic designs are available to choose from — many are obtainable only from Hendrick. Hendrick will gladly cooperate with architects to help select from a wide range of standard and special designs. For more complete details write Hendrick today!

SEE OUR CATALOG IN SWEET'S

Hendrick
MANUFACTURING COMPANY

48 DUNDAFF ST., CARBONDALE, PA. • *Sales Offices in Principal Cities*
Perforated Metal • Perforated Metal Screens • Wedge-Slot Screens • Architectural Grilles • Mitco Open Steel Flooring • Shur-Site Treads • Armorgrids

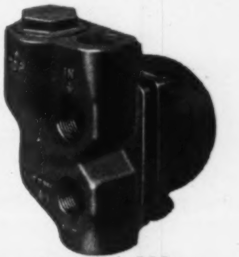
That's right
LOOK AGAIN

ALL TRAPS are NOT ALIKE

here's why the **THERMOSTAT** *in* **Sterlco® TRAPS** *does more for you...*

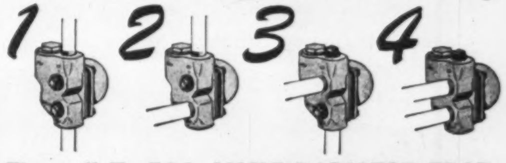
1. It compensates for changes — operates satisfactorily even if pressures vary.
2. It cannot be damaged by excessive steam pressures or by freezing.
3. If the bellows is damaged, the spring action closes the valve. Trouble is immediately located because unit or radiator becomes cold — no waste of steam — no searching. Thermal element easily replaced.

The 3/4" 69B FLOAT and THERMOSTATIC TRAP



Ideal for installation and rehabilitation of unit heaters. Dependable, compact, large capacity, easy servicing and rugged construction makes 69B an outstanding performer on unit heaters and other steam heating equipment.

Install the most convenient Way



The 1/2" 7—50A ANGLE RADIATOR TRAP

Keep radiators clear of condensate without wasting steam. Sturdy bronze bodies and covers—replaceable seats. Angle, Straightway, Corner or Vertical styles.

STEAM HEATING is MODERN, EFFICIENT and DEPENDABLE.

Sterlco Products Distributed through
LEADING HEATING and PLUMBING WHOLESALERS

STERLING, INC.

3732 N. Holton St., Milwaukee 12, Wisconsin

CONDENSATION AND VACUUM PUMPS

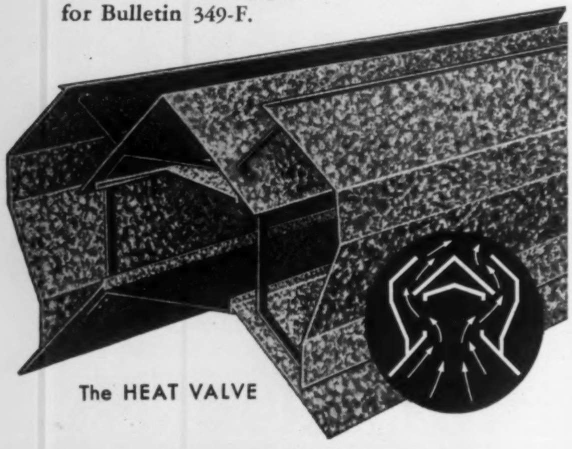
HEATING SPECIALTIES

TEMPERATURE CONTROLS

The AIRMOVER

For Low Cost *Natural* Ventilation it's good business to use these Swartwout Ventilators

Beat the cost of power and expensive duct work when *Natural* (gravity) ventilation will do the job. In thousands of industrial and commercial buildings Swartwout AIRMOVER and Swartwout-Dexter HEAT VALVE move enormous quantities of heat, smoke and fumes at *no after-installation cost* except small maintenance. And original cost is economical per square foot of opening. . . . It pays you to get Swartwout help on your ventilating problems. Write for Bulletin 349-F.



The HEAT VALVE

18568 Euclid Avenue, Cleveland 12, Ohio
The Swartwout Co.
Roof Ventilators and Ventilating Louvers
POWER PLANT EQUIPMENT • PROCESS INDUSTRY CONTROLS

WHO'S WHAT

Continued

▸ *DRAVO CORP.*—H. W. North, chief engineer of the newly established Process Equipment Dept. of Dravo's Engineering Works Div. The new department will design, fabricate and market pressure vessels, mixers, blenders, filtering equipment and related machinery.

▸ *CONVECTOR MANUFACTURERS ASSN.*—Reelected officers: Robert S. Rickabaugh, president; Ray O. Reeves, vice president; George W. McCormick, Jr., secretary treasurer. Mr. Rickabaugh is sales manager, Wet Heat Div., Tuttle & Bailey, Inc.

▸ *AMERICAN ENGINEERING CO.*—John W. Tyler, staff engineer with headquarters in Philadelphia.

▸ *O. A. SUTTON CORP.*—F. J. Jessup, Jr., product manager of the company's Commercial Div. in Wichita.

▸ *INTERNATIONAL NICKEL CO., INC.*—Albert P. Gagnebin, assistant manager of nickel sales; Edward B. Bitzer, assistant manager of nickel alloys; Keith D. Millis, charge of ductile iron section; Robert M. Wilson, Jr., development engineer in the power field for the Development and Research Div.

▸ *AMERICAN MACHINE AND METALS, INC.*—A. M. Harp, general sales manager. Mr. Harp is returning to the company after recently serving as vice president and general manager of Connecticut Telephone and Electric Co.

▸ *NEW YORK AIR BRAKE CO.*—Thomas W. Johnson, director of engineering in the company's five divisions: Kinney Mfg. Co., Aurora Pump Co., Dudco Div., Hydreco Div. and Watertown Div., makers of hydraulic, liquid and vacuum pumps.

▸ *RESEARCH-COTTRELL, INC.*—Harry M. Pier, special assistant to the chairman of the board to conduct new studies in the field of atmospheric pollution. Charles E. Beaver succeeds Mr. Pier as general sales manager.

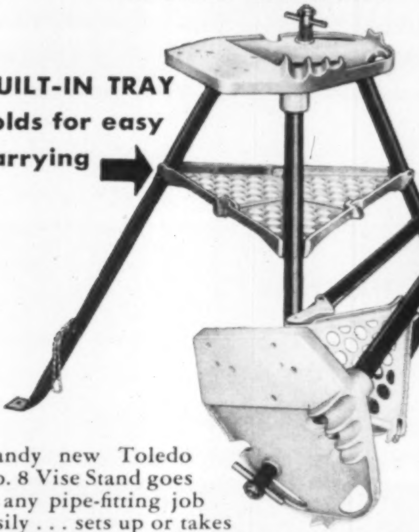
▸ *BORG-WARNER CORP.*—John Polomski, chief engineer of the products development laboratory in Detroit.

▸ *PRAT-DANIEL CORP.*—Richard F. Sharon, manager of the Thermobloc Div.

▸ *MANHATTAN RUBBER DIV., RAYBESTOS-MANHATTAN, INC.*—James Adams, Jr., chief engineer, research and product design.

NEW TOLEDO VISE STAND

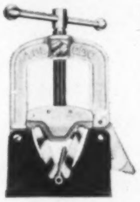
a Sturdy Lightweight Work Bench!

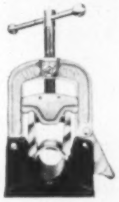


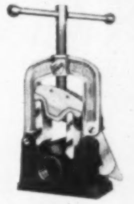
Handy new Toledo No. 8 Vise Stand goes to any pipe-fitting job easily . . . sets up or takes down quickly . . . saves time and effort. All one unit, no loose parts. Extra rugged, won't fold up in use. Large size vise base for easy mounting of Toledo or other vises. 3 pipe benders, plenty of tool slots, pipe rest, ceiling brace. See it now—a great value at your supply house!

NEW TOLEDO PIPE VISE

Exclusive ROCKING-WEDGE ACTION JAWS


Small Pipe from ⅛″


Larger Pipe to 2½″


Tees, Ells Valves

Grips any shape without crushing. Jaw action tends to eliminate marking of pipe. Heat treated jaws. Capacity—No. 1 Vise, ⅛″ to 2½″. Order through your supplier.

THE TOLEDO PIPE THREADING MACHINE CO.
Toledo 4, Ohio

"TOLEDO"
TRADE-MARK REGISTERED U.S. PAT. OFFICE

Builders of the World's Finest Pipe Tools

PIPE THREADERS
PIPE WRENCHES
POWER PIPE MACHINES

They SELL! They PLEASE!

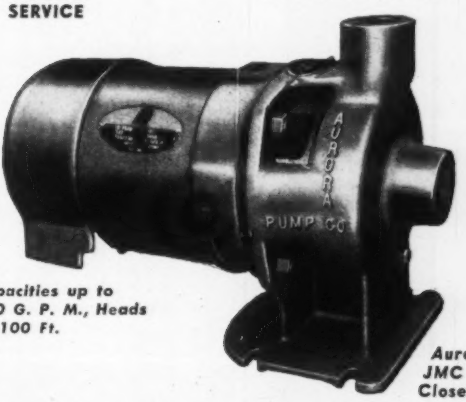
AURORA CLOSE-COUPLED *Packaged*

AIR CONDITIONING PUMPS

for EVAPORATOR COOLING TOWERS
•
AIR CONDITIONING UNITS
•
***also for* GENERAL SERVICE**

These are outstanding pumps, high in favor with air conditioning contractors and manufacturers of air conditioning equipment. Mechanical seal requires no packing or maintenance. Disassembly without disturbing pipe connections or hold down bolts.

- LOW COST
- SMOOTH, QUIET
- DEPENDABLE
- LONG LIVED
- MECHANICAL SEAL
- DISASSEMBLY is QUICK, SIMPLE
- CARRIED IN STOCK



Capacities up to 150 G. P. M., Heads to 100 Ft.

Aurora Type JMC Pump — Close-Coupled

CASINGS vertically split. Casing wearing ring standard.

MECHANICAL SEAL—standard, located in packing cover.

IMPELLER — balanced, enclosed type, high grade bronze.

MOTOR—NEMA specs., stainless steel shaft on JMC — for all circuits and various enclosures.

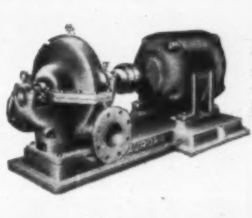
BALL BEARINGS — on JMC, built into motor.

OTHER AURORA AIR CONDITIONING UNITS

We are also in a position to supply various sizes of air conditioning pumps in V-Belt drive, and flexible coupling drive. Our large size type G.M.C. Close-Coupled Pumps can be furnished up to 800 G. P. M. and heads to 200 ft.

ALSO — AURORA SPLIT CASE CENTRIFUGAL PUMPS

—single and two stage for water supply, handling condenser circulating water, brine circulation, booster service and many other duties.



Complete Information on Request

AURORA PUMP DIVISION
THE NEW YORK AIR BRAKE COMPANY
80 LOUCKS STREET AURORA • ILLINOIS

SERVICED BY THE MEN WHO SELL IT

Another reason why You can depend on

TAPECOAT®

the Coal Tar Protection in Handy Tape Form

The service behind TAPECOAT is as distinctive as this coal tar coating, itself.

To make this service as dependable as the product, the sales engineer who sells the job also services it. This means that you can count on everything he tells you because he is responsible for the job *personally*.

The fact is, TAPECOAT gives you more lasting protection for your money because it is a quality coal tar product, and coal tar is nature's own defense against corrosion.

Specify TAPECOAT for pipe, pipe joints, tanks, and other vulnerable steel surfaces above or below ground. Its performance record since 1941 merits your complete confidence.

TAPECOAT comes in rolls of 2", 3", 4", 6", 18" and 24" widths. It's easy to apply as our sales engineers will demonstrate.

Write for brochure and prices today.

The TAPECOAT Company

Originators of Coal Tar Tape Protection

1555 Lyons Street, Evanston, Illinois

WHO'S WHAT

Continued

▸ *LAU BLOWER CO.*—With purchase of substantial interest in the company, five executives elected to new positions are Harold W. Faulkender, president; Thomas I. Byrd, executive vice president; Richard L. Perkins, secretary and assistant treasurer; Charles E. Hubbard, treasurer; and Joseph L. Lair, assistant secretary and legal counsel.

▸ *STONE & WEBSTER ENGINEERING CORP.*—Franklin C. MacKrell, district manager of the Chicago office. Mr. MacKrell is a vice president of the company.

▸ *SWARTWOUT CO.*—Ernest H. Bellard, vice president in charge of sales; William H. Krueger, treasurer and controller.

IN THE TERRITORIES . . .

(Recent sales appointments)

▸ *CONOFLOW CORP.*—Williams Equipment Co., southeastern Louisiana, and southern Mississippi; Engineered Instrument Sales Co., western Tennessee, northern Mississippi and eastern Arkansas; George S. Edwards, Alabama sales representative.

▸ *MACHINERY AND SYSTEMS DIV., CARRIER CORP.*—William L. Yerkes, Los Angeles district manager; John F. Kooistra, Washington, D.C. representative; Thomas S. Campion, San Francisco branch manager, replacing Mr. Kooistra.

▸ *SPENCER HEATER, LYCOMING DIV., AVCO MFG. CORP.*—Louis B. Gorman, district sales manager for the South Central and Central states. Charles R. Miller, formerly in that post, will now concentrate his activities on the Eastern Seaboard and New England states.

▸ *MITCHELL MFG. CO.*—Philadelphia Distributors, handling room air conditioners in the Philadelphia and Trenton areas; William Crockett, sales representative for northern Indiana, Michigan and Ohio.

▸ *MINNEAPOLIS-HONEYWELL REGULATOR CO.*—Arnold Challman, administrative assistant to T. S. Carley, manager of the Chicago sales and service office; R. C. Ferguson, Peoria branch office manager; R. R. Scott, Davenport, Ia. office manager.

▸ *J.F. PRITCHARD & CO. OF CALIFORNIA*—Brownlee-Morrow Engineering Co., representative in Alabama and western tip of Florida; Rittelmeyer and Co., Inc., Georgia, eastern Tennessee, eastern and southern Florida.

TVC *Condensate Pumps*

LOW PRESSURE SYSTEM

LOW RETURN CONNECTION
LOW SPEED, LONG LIFE
CAST IRON RECEIVER
SINGLE OR DUPLEX

A SINGLE UNIT easily converted at any time to a DUPLEX UNIT

Specify the "Convertible" TVC in the 15 gallon receiver when ordering low pressure system condensate pumps.

Capacities from 500 to 10,000 sq. ft. E.D.R.

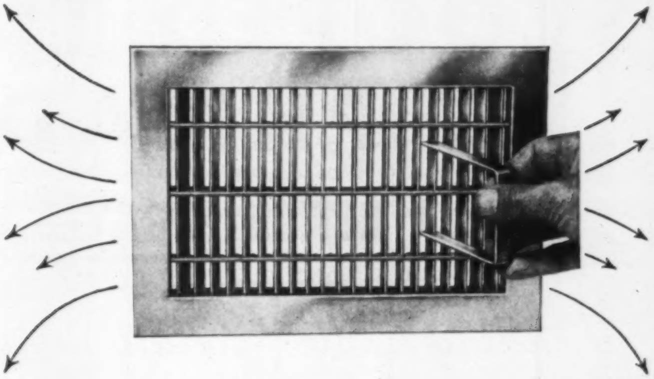
Available from Jobbers' Stock

The Single Unit TVC Condensate Pump in a 15 gallon receiver can be converted to a DUPLEX UNIT whenever load or other conditions require. Each receiver is furnished machined and drilled for the addition of another pump and control.

Conversion to a Duplex Unit doubles the capacity of the unit, or where desired, provides a stand-by pump. Additional pump is installed right on the job. Removal of the unit is unnecessary.

- **Dimensions**
  15 gallon cast iron receiver for single or duplex units: diameter 25½", height of return above floor—7$\frac{3}{16}$". 10 gallon cast iron receiver (for single units only): diameter 21", height of return above floor—6⅞".
- **Features**
  TVC Condensate Pumps are low speed (1750 RPM) for long life, are readily installed in area where space is important. Their compact cast iron receiver and sturdy pumping unit assure a trouble free installation.
- **Installation**
  Simple installation consists of connecting return line to receiver, and connecting discharge to boiler, using a check valve and a gate valve. Unit is completely assembled at the factory. Send for Bulletin TVC300.

weil PUMP CO. 1514 N. FREMONT ST. • CHICAGO 22



where you
want the best

in SCHOOLS
in HOSPITALS
in PUBLIC BUILDINGS

SPECIFY THE SOLID BAR TYPE GRILLE & REGISTER

Solid 14 gauge Bars make the Grilles and Registers rugged and long lasting. Their interlocking construction makes them Tamper-proof — adjustable only with special tool provided with each order. Where you want the best in construction and performance — there is no other choice. It's R & G all the way!

- **Constructed of sturdy 14 gauge steel bars.**
- **Interlocking Cross Bars for Added Strength.**
- **Fixed Bars, single or double deflection.**
- **Tamperproof and Kickproof — Built to withstand abuse.**

R G

Complete Line of Registers and Grilles for
HEATING VENTILATING AIR CONDITIONING

REGISTER & GRILLE MFG. CO., INC.
70 BERRY STREET, BROOKLYN 11, N. Y.

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Specify and **Install** **R & G**
REGISTERS and GRILLES

WHO'S WHAT

Continued

▶ *WOLVERINE TUBE, DIV. OF CALUMET & HECLA, INC.*—Appointments and territories are: R. C. Crowe, southeastern Michigan; K. F. Egan, upper New York State; E. J. Finn, Boston; Robert M. Fritz, Oklahoma and north Texas; E. C. Humphrey, upper peninsula of Michigan, northwest Wisconsin, Minnesota and North and South Dakota.

▶ *FAIRBANKS CO.*—Charles W. Freeman, sales representative in Georgia; Douglass Lindsay, a similar post in Virginia, the position formerly held by Mr. Freeman.

▶ *EBERT ELECTRONICS CORP.*—Kriegner Sales Co., representatives for Ebert's line of relays in eastern Pennsylvania, Delaware, and southern New Jersey.

▶ *ACME INDUSTRIES, INC.*—Dayton F. Hyde, St. Louis territory; Bostock & MacJennett, San Francisco. northern California and Reno representative.

▶ *GLASS FIBERS, INC.*—Francis W. McPeek, Cincinnati sales representative including southern Ohio, southern Indiana and northern Kentucky.

▶ *WORTHINGTON CORP.*—Roland W. Bartlett, manager of Detroit district office.

▶ *SWARTWOUT CO.*—Irving R. Schwartz, regional product manager for the company's Autronic process controls division for the New York, New England area; Paul H. Strehle, Jr., a similar post for the Philadelphia and East Central territories. Responsibility for sales and service for the roof ventilator division has been assigned to the company's southern California district office in Alhambra.

▶ *JACKES-EVANS MFG. CO.*—O. W. Swaim, representing the company's controls division in the Dayton and Detroit areas, West Virginia and parts of Indiana, Kentucky, Pennsylvania and New York.

▶ *CHASE BRASS & COPPER CO.*—A. Reece Hooks, Jr., Atlanta district manager, replacing Herman H. Herring, transferred to New Orleans; Joseph M. Jolley, New Orleans district manager, replacing John M. Gehl, Jr. As southern regional manager, Mr. Gehl will supervise district sales offices and warehouses in Houston, Dallas, Atlanta and New Orleans. Herman H. Kremer, manager of the new district sales office in Charlotte, N.C.

▶ *FRETZ-MOON TUBE CO.*—Andreas O. Wilson, sales representative for small diameter steel pipe.

▶ *SPRINGFIELD BOILER CO.*—C. B. Fuller, New England sales representative with headquarters in Boston.

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WITH A BETTER SPRAYED COIL DEHUMIDIFIER

Leading Air Conditioning Engineers Praised

SLOPING COILS FOR BETTER SPRAY COVERAGE
INSTANTLY REMOVABLE GLASS MAT ELIMINATORS
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LOW-PRESSURE PIPE COVERINGS . . .
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Prompt service at all times on a complete line of pipe insulation for hot, cold and chilled water and steam lines.

Your inquiries will receive our prompt attention.

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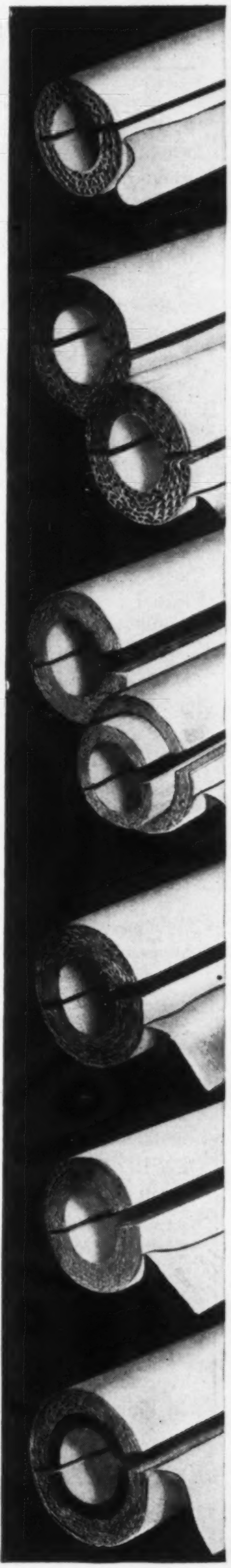
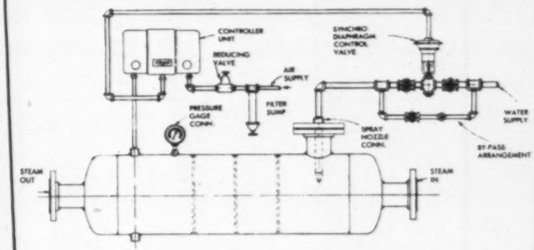


For effective evaporation type desuperheating Specify WHITLOCK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This efficient "package" desuperheats steam and permits use of low pressure, economical equipment. Operating on the evaporation principle of heat removal, the Whitlock Evaporation Type Desuperheater offers these outstanding features:

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read low surface temperatures in *5 Seconds* *Accurately!*

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Quick Accuracy...the 2300 assures the highest standards of speed, accuracy and dependability—you can read most low surface temperatures in 3 to 5 seconds.

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WE HEAR THAT...

▸ Organization of a new technical unit committee whose objective will be to define certain minimum standards of film formulation and application is announced by the *NATIONAL ASSOCIATION OF CORROSION ENGINEERS.* The first meeting will be held during the 11th annual NACE Conference and Exhibition in Chicago, March 7-11.

Specific objectives of the committee are to study bonding agents or adhesives, prefabricated plastic films presently available and as discovered in the laboratory, proper applications of both pressure sensitive and prefabricated films to pipelines and preparation of a history of experience and results from use of prefabricated films.

▸ Engineering and construction on facilities of *CRAMET, INC.*, a subsidiary of *CRANE CO.*, were more that 50 percent completed at the end of 1954. Initial production of titanium sponge in production facilities was started in January.

While practically all of the titanium production now is for government work, it is expected to meet many needs in the piping field where corrosive products are involved. For instance, in one installation one titanium valve costing approximately $1000 recently replaced conventional valves which lasted only one week in service before requiring replacement.

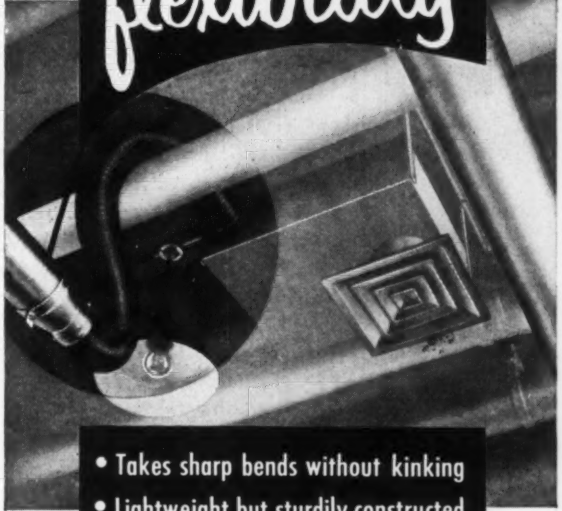
▸ In 15 years or less, *KAIGHIN & HUGHES, INC.*, heating, piping and air conditioning contractor in Toledo, has grown from a small heating and piping shop into a multi-million dollar business. The growth started in 1940 when the shop got an $18,000 job for a steam line at the *GOODYEAR TIRE & RUBBER CO.* in Akron.

▸ The retirement of *MAX H. FOLEY* has brought about the formation of a new partnership operating under the name of *VOORHEES WALKER SMITH & SMITH.* The architectural and engineering firm is located at 101 Park Ave., New York 17.

▸ *S. S. FRETZ, JR., INC.*, Philadelphia distributor for *AIRTEMP DIV., CHRYSLER CORP.*, recently held a meeting attended by more than 260 dealers from the Delaware Valley and south Jersey sales districts, architects, FHA, VA and Airtemp officials and press representatives. The parley was held at the Drake Hotel in Philadelphia.

▸ *CARRIER CORP.* has acquired full ownership of *CAMBRIDGE CORP.*, an engineering and manufacturing concern which was previously owned jointly by Carrier and *ARTHUR D. LITTLE, INC.*

WIREMOLD AIR DUCT has unlimited flexibility



• Takes sharp bends without kinking
• Lightweight but sturdily constructed
• Greatly reduces installation time
• Air tight and flame resistant

Wiremold Flexible Air Duct was developed to meet the requirements for connections between branch ducts and air diffusers on high and low velocity commercial air conditioning systems. Its exclusive construction and specially coated Fibreglas fabric assure long life. Fabric component is *mechanically locked* into the strong, steel spiral . . . no glue or adhesive to dry out or crack, and accidental punctures can easily be sealed.

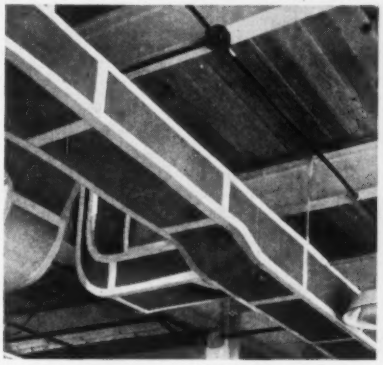
Air Duct provides practical flexibility to planning and layout. Exact positioning of outlets and connections is not essential. It's the ideal solution to ducting problems in cramped quarters, and for systems where every connection is at a different angle. One man can make a connection with this lightweight, flexible material, which snakes easily around structural members, saves time and money on installation. As the final complement to modular acoustical ceilings, Wiremold Air Duct permits relocation of diffusers without moving permanent duct work, so that air distribution for entire areas can be rearranged easily and quickly.

For complete information, write to Dept. F3

The WIREMOLD Company
Hartford 10, Connecticut

COSTS MORE and WORTH IT!

Grant Wilson
DUX-SULATION
ASBESTOS PROTECTED



Despite the advent of many lower priced insulations, many of the nation's leading architects and engineers continue to specify Grant Wilson Dux-Sulation. One reason is that Dux-Sulation is just about indestructible — can't possibly be crushed or cracked. Its insulation and sound absorption efficiency, high to start with, *cannot* be impaired during installation.

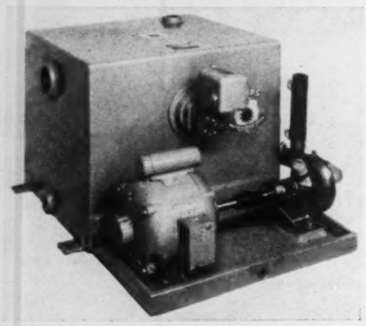
Dux-Sulation can't powder, shift or sift. There are no "thin" spots, even at corners. There is no deterioration of any kind, no change of any kind. Insulating values are constant, indefinitely!

Special adhesive and tape (supplied) obviate the need for any additional "fasteners". If desired, Dux-Sulation can be applied in the shop and still withstand all necessary handling. On all counts, especially on projects where nothing less than the best is acceptable, Dux-Sulation is still your logical choice — the insulation you can specify with *absolute confidence* . . . no ifs, ands or buts!

write for Bulletin 567H-3

Grant Wilson inc.
ASBESTOS and INSULATING MATERIALS
141 WEST JACKSON BLVD. • CHICAGO 4, ILLINOIS

YOUR BEST BUY IN CONDENSATE PUMPS



Is The EAGAN EAGLE

This high quality unit offers you these outstanding advantages: *low initial cost; far more capacity than any other similar pump at the same price* (to 8000 sq. ft. EDR at 20 psi); *a low return inlet* (to eliminate need for a pit even though return lines are as low as a foot above the floor); *all bronze centrifugal pump* with a nonclogging open impeller, stainless steel shaft; *flexible connectors and coupling* (to isolate the pump, eliminate pipe cramp, wear and noise); *thermal overload protection; a level indicating float switch.*

These advantages — and many more — are yours for the asking with the Eagan Eagle. (other models available with capacities to 100,000 sq. ft. at 200 psi.) Write for Bulletin and prices.

WALTER H. EAGAN CO., INC.

Mfrs. of condensate, vacuum, turbine, boiler feed, centrifugal, proportioning and fuel oil pump and heater sets.

Pump Specialists Since 1920

2337 Wallace Street **Philadelphia 30, Pa.**

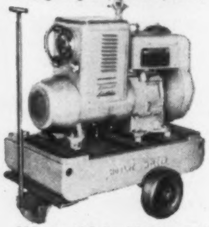
200 amp.
A. C. Welding
plus
POWER
for tools, lights, etc.

AC Arc Welder and AC Power Unit for welding and operating lights, tools, etc.

To speed up the job and cut costs, plumbers and metalsmiths are using low cost Hobart Arc Welding wherever they can.

A popular model with the plumbing and heating contractors is the combination AC Arc Welder and AC Power Unit. This two purpose machine supplies 200 amperes for welding or 5 KW AC Power for operating tools and lights where electric power is not available.

No matter what your requirements are, Hobart has a welder that is right for your work. Compact, lightweight welders for easy loading in truck or trailer or AC Transformer type welders for shop work. Check and return the coupon today for complete details.



200-amp DC Arc Welder with air-cooled engine.

AC Transformer Type Welder for general shop use.

HOBART TROY OHIO **WELDERS**

Tear off and MAIL TODAY!

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Without obligation, please send information on items checked.

☐ AC Welder-AC Power Unit ☐ 200-amp DC Gas Drive
☐ AC Transformer Welder ☐ Electrode samples for______

NAME________ POSITION________
FIRM________
ADDRESS________

WE HEAR THAT

Continued

▶ *FISHER GOVERNOR CO.* has purchased a factory building in Woodstock, Ontario, Canada, and will start manufacturing operations there this spring, the company announces. The plant is a one story building with 17,250 sq ft of space. Diaphragm motor valves, liquid level controllers and gas regulators will be manufactured there.

▶ "Controlorama," an educational show developed by *PENN CONTROLS, INC.* for heating, air conditioning and refrigeration engineers and servicemen, is touring 23 central cities. The tour will end April 20 at Grand Rapids.

▶ *PENNSYLVANIA SALT MFG. CO.* announces the recent opening of a new plant at Delaware, Ohio. This plant, Pennsalt's thirteenth production facility, is part of the company's chemical specialties division.

▶ *ROBERTSHAW-FULTON CONTROLS CO.* will be able to double its production of thermostatic controls and ignition devices for gas heating appliances at its new Grayson Controls Div. plant in Long Beach, Calif., the company says. The $3 million plant with 237,000 sq ft of floor space has almost twice the area of the division's former installation at Lynwood, Calif.

▶ "Eutectic Welding Institute on Record," a two hour, 33 rpm album of the week long courses held at *EUTECTIC WELDING ALLOYS CORP.*, is now available for business, the company has announced.

▶ The plastic metals plant of *THE NATIONAL RADIATOR CO.* has received a first place award in the 1953-54 safety contest sponsored by the Metals Section of the National Safety Council.

▶ The shareholders of *BURGESS-MANNING CO.* have formally approved a plan of merger under which *PENN INSTRUMENT CORP.* will join the Libertyville, Ill. company.

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DISTRICT

HEATING

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THIRD EDITION

An Entirely New Volume — 529 Pages
15 CHAPTERS — 6"x9¼"

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- ECONOMICS OF DISTRICT HEATING
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Price $7.00

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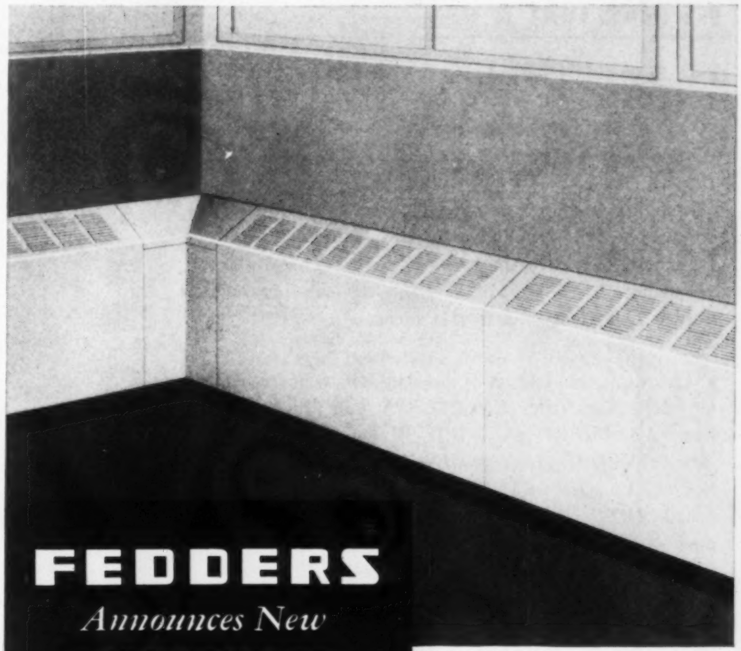
827 N. EUCLID AVE.,
PITTSBURGH 6, PA.



FEDDERS
Announces New
CONTINUOUS CONVECTOR-RADIATORS

For Schools, Institutions, Offices, Commercial, Industrial and Public Buildings

HEATING MEN welcome them for installation under rows of windows and in large rooms and corridors.

ELEMENT—High capacity single element gives maximum heat transfer per running foot. Element is made of 3/4" O. D. copper tubing with aluminum fins.

ATTRACTIVE DESIGN—Cabinets are styled to harmonize with architectural requirements. Sloping top prevents cabinet being used as a seat or shelf. Integral grille at top directs the heat upward and outward into the room. Cabinets have interlocking fronts for smooth long runs.

PACKAGE UNIT—Formed steel brackets support the element and anchor the front panel. Heating element is assembled in cabinet at the factory, and shipped as packaged units. Chain or knob type dampers are available.

PIPING—Convector assemblies are packaged in left and right hand and intermediate sections. Intermediate sections have element tubes expanded on one end for quick, easy joining of adjacent tubes without couplings.

Write for new Bulletin CTS-C1

FEDDERS-QUIGAN CORPORATION
Lalor and Hancock Sts., Trenton 7, N. J.

WE HEAR THAT

Continued

▶ In an annual sales meeting in Salem, Ohio recently, *WALTER F. DEMING*, president of *THE DEMING CO.*, told his firm's salesmen, "We see 1955 as potentially one of the best years in the Deming Co.'s 75 year history."

An improved line of products, increased plant efficiency, a full scale advertising and publicity program, and new distribution facilities and new plant, are factors cited by Mr. Deming that are expected to play important roles in this success.

▶ The Minnesota section of the *AMERICAN SOCIETY OF MECHANICAL ENGINEERS* and their guests from the *AMERICAN SOCIETY OF HEATING & AIR-CONDITIONING ENGINEERS* and *AMERICAN SOCIETY OF REFRIGERATING ENGINEERS* heard *ARTHUR MOODY*, senior development engineer of *TRANE CO.*, speak following their January 5 dinner meeting. Mr. Moody spoke to the 70 engineers on "Part Load Performance of Centrifugal Refrigeration Machines." The meeting was held at the University of Minnesota in Minneapolis.

▶ Managements of the *GARDNER-DENVER CO.* and the *KELLER TOOL CO.* have announced that the stockholders of both companies have approved a consolidation. Keller Tool now becomes the *KELLER TOOL DIV. OF GARDNER-DENVER CO.* and will continue operations under former Keller management.

▶ Establishment of a new branch sales and engineering service office in Hammond, Ind., has been announced by *MINNEAPOLIS-HONEYWELL REGULATOR CO. O. V. SPOUSTA*, formerly manager of the Louisville office, will manage the new office.

▶ The first unit of a new plant which, the company says, will eventually quadruple the present production facilities of *MARLO COIL CO.*, began operation recently. The 80,000 sq ft building is located on a 23 acre tract in south St. Louis.

▶ Construction has begun on two additional facilities at the *GENERAL CONTROLS CO.'s* plant in Glendale, Calif. A 15,000 sq ft area is being added to the present engineering space and will be used for both tooling and engineering. A second story is being added to the main administrative building, increasing the office area by one third.

▶ *GENERAL CONTROLS CO.* has moved its regional sales office and warehouse from Birmingham to 1479 Spring St., N.W., Atlanta.

CARVER PUMPS are virtually MAINTENANCE-FREE because

MECHANICAL SEAL permanently seals against shaft leakage. *No expensive time or material required to service these pumps.*

FRAME BEARINGS ARE GREASED FOR LIFE and *positively sealed against dirt and water.*

Trouble-free and maintenance-free, CARVER PUMPS are "*Your Best Buy for Better Performance.*"

Write for complete information today.

CARVER PUMP CO., 1460 Hershey Ave., Muscatine, Iowa

The quality name in pumps

NEW HOPE

in the battle against

CANCER

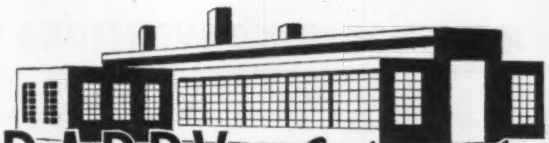
THE FIGHT against man's cruelest enemy is far from won. If present rates continue, 23 million living Americans will die of cancer—230,000 *this year*. And thousands of these will die needlessly—through cancer that could have been cured if treated in time.

ALL THE SAME, there have been victories. Thousands who once would have died are being saved—thanks, in part, to *your* donations to the American Cancer Society.

AND, LAST YEAR, the Society was able to allocate $5,000,000 of your donations to research aimed at finding the ultimate cure for *all* cancer. That's more money than ever before.

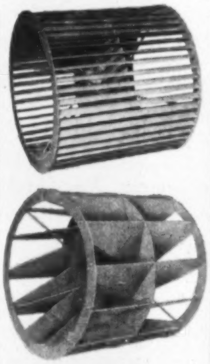
MUCH MORE, of course, remains to be done. So please make *this* year's gift a really *generous* one!

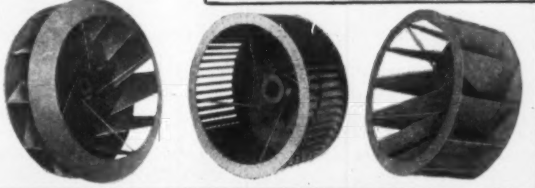
Cancer
MAN'S CRUELEST ENEMY
Strike back—Give
AMERICAN CANCER SOCIETY



BARRY *Industrial* BLOWER WHEELS

Built to your specifications. All types heavy duty wheels — single inlet, double inlet, forwardly curved, and backwardly curved — all sizes 6" to 72". diameter. Welded or riveted construction. Prompt deliveries. BARRY blower wheels are precision built, expertly trued, and perfectly balanced by specialists for long, smooth service. Send specifications for quotation, performance data, etc. to BARRY BLOWER CO., Minneapolis 18, Minnesota.





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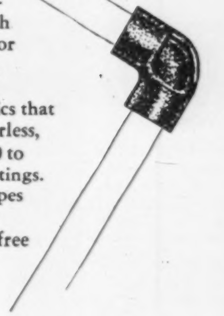
HANDLES MOST CORROSIVES

. . . at lower cost

DUR-ACE
is a moderately priced, general-purpose, rigid plastic pipe with exceptional impact strength. For handling most inorganic acids, salts, alkalis and many organic chemicals, it's the equal of plastics that cost far more. Light weight, odorless, tasteless. Temperatures minus 40 to 170° F. Sizes ½ to 2", with fittings. Dur-Ace is only one of *eight* types of rubber and plastic pipe now made by ACE. Write today for free technical bulletin 80-A.



ACE rubber and plastic processing equipment • SINCE 1852

AMERICAN HARD RUBBER COMPANY, 93 Worth St., New York 13, N. Y.

BE *Sure* with CORNISH

Wired Assemblies

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economy
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adaptability

—all figure in your wiring problems. CORNISH specialists, through smartly integrated engineering and production control from rod mill to molding, supply a service of inestimable value to leading manufacturers of Heating and Air Conditioning Equipment.

"MADE BY ENGINEERS FOR ENGINEERS"

CORNISH-RUTLAND CO.
Rutland, Vermont

G&O COILS *for* HEATING *and* COOLING

G&O RADIATION

A full line of sizes now available to meet all industrial requirements. Send for catalog.

THE G&O MANUFACTURING COMPANY
New Haven 8, Connecticut
Pioneer Manufacturers of Square Finned Tubing in the United States

WATER FILTERS

All of the outstanding qualities that have made MARVEL SYNCLINAL FILTERS the overwhelming choice in the filtration of hydraulic oils and other oil base liquids have been adapted to provide the same efficiency in the filtration of water.

Balanced Synclinal Design means longer periods of efficient filtration and productive operation.

STURDY CONSTRUCTION

to withstand use under rugged conditions, yet simple enough to allow any workman to easily disassemble, clean and reassemble on the spot, in a matter of minutes.

A SIZE FOR EVERY NEED

Available in line and sump type units in capacities from 5 to 100 G.P.M. Permanent type Monel metal insert ranging in mesh sizes from coarse 30 to fine 200.

Complete data and further information are contained in WATER CATALOG #300.

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LINE TYPE (Cutaway)
IMMEDIATE DELIVERY!

Marvel not only delivers a top grade filter in both quality and performance, but DELIVERS IMMEDIATELY. If desired, shipments are made on same day orders are received.

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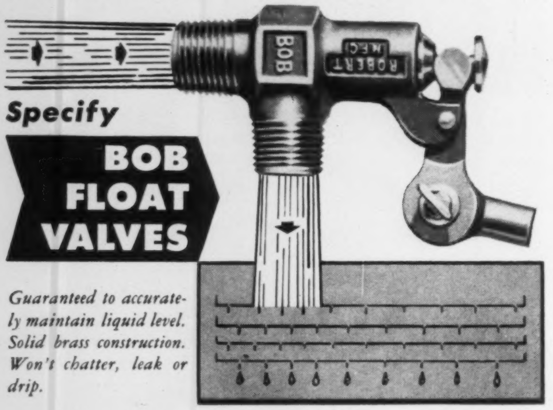
The Standard Valve For COOLING TOWER applications . . .



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BOB FLOAT VALVES

Guaranteed to accurately maintain liquid level. Solid brass construction. Won't chatter, leak or drip.

Standard equipment for Major COOLING TOWER manufacturers and piping fabricators for POSITIVE-ACTION and unsurpassed performance under the toughest service conditions. Take advantage of the savings thru standardization *—one source for completeness of line—smaller and more flexible inventory—preventive maintenance—safety—durability—interchangeability—increase of sales—customer satisfaction and* ECONOMY.

Competitively priced and available in sizes from ⅜" to 1½". Write for details of complete line.

ROBERT Manufacturing Company
9035 Venice Boulevard, Los Angeles 34, California

MEETINGS & CONVENTIONS

MAR. 7-11—*11th Annual Conference and Exhibition of the National Association of Corrosion Engineers,* technical committees reports. Palmer House, Chicago. Registration: A. B. Campbell, c/o the association, 1061 M & M Bldg., Houston 2.

MAR. 9-12—*National Warm Air Heating and Air Conditioning Association,* short course on the latest trends in the warm air heating industry. Purdue University, Lafayette, Ind. Courses will be held March 28-31 at Michigan State College, East Lansing; April 6-8 at Penn State College, State College, Pa.; April 18-21 at Iowa State College, Ames. Chairman: Bruce McLouth, NWAHACA, 145 Public Sq., Cleveland 14.

MAR. 17-19—*Educational Conference of the Air Conditioning and Refrigeration Industry.* Biltmore Hotel, Atlanta. Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N.W., Washington, D.C. Hotel reservations should be made by writing the Atlanta Convention Bureau, Rhodes-Haverty Bldg., Atlanta 3.

MAR. 28-29—*2nd Annual Air Conditioning Conference.* Sponsored by the Mechanical Engineering Dept., University of Missouri, in cooperation with the Adult Education and Extension Service of the university, Columbia, Mo.

APR. 1-2—*Michigan Engineering Society,* 1955 convention. Cranbrook, Bloomfield Hills (near Detroit), Mich.

APR. 4-7—*Oil-Heat Institute of America,* 33rd annual convention. Edgewater Beach Hotel, Chicago. OHI headquarters, 500 Fifth Ave., New York 36.

APR. 13—*Bituminous Coal Research, Inc.,* annual meeting. William Penn Hotel, Pittsburgh. A sales conference will be held on the preceding day. BCR is at 2609 First National Bank Bldg., Pittsburgh 22.

APR. 14-16—*American Society of Heating and Air-Conditioning Engineers, Inc.,* regional meeting. Skirvin Hotel, Oklahoma City. ASHAE headquarters, 62 Worth St., New Work 13.

APR. 16—*American Society of Mechanical Engineers,* Organization Anniversary Meeting. Stevens Institute of Technology, Hoboken, N. J. and New York City. Succeeding scheduled meetings are the Diamond Jubilee Spring Meeting, April 18-22, Baltimore; Diamond Jubilee Semiannual Meeting, June 19-23, Boston; Diamond Jubilee Annual Meeting, November 13-18, Chicago. Attendance at some sessions will be

Extremely Low Silhouette Design

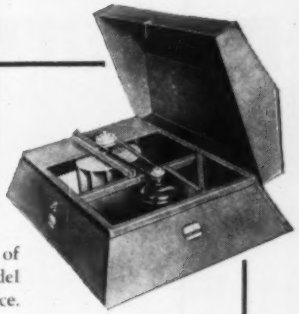
. . . the NEW
LO-BOY MODEL
CENTRIFUGAL ROOF EXHAUSTERS

- Quality
- Beauty
- Proven Performance

Sizes 10" to 72"
600 — 47,000 CFM

AirMpeler

Motor mounting on side of support structure . . . out of line of air stream reduces height of the LO-BOY model nearly 50 per cent of older models. Low wind resistance. Adds to skyline beauty of your buildings. You'll be proud of the new LO-BOY.



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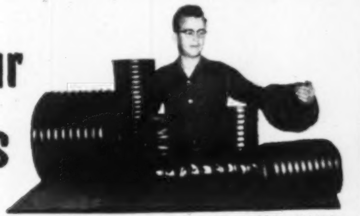

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FUME CONTROL AND VENTILATION
DUST AND CHIP COLLECTION
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The high-quality, reinforced, spiral-wire hose designed for moving air, dust, fumes, materials.

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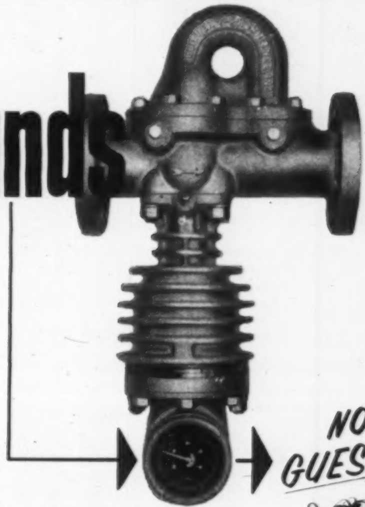
pounds



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Install BUILDERS SHUNTFLO STEAM METERS right in your steam lines. Keep track of steam costs by seeing where steam is going and how much. Shuntflo Meters available in Model SMKS (shown) for 2" to 14" lines — Model SMDH for 1" and 1½" lines. **Write for Shuntflo Bulletins. Builders-Providence, Inc. (Division of B-I-F Industries, Inc.), 381 Harris Ave., Providence 1, R. I.**

BUILDERS-PROVIDENCE
DIVISION OF B-I-F INDUSTRIES, INC. METERS FEEDERS CONTROLS

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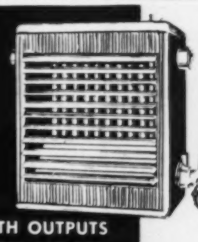

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Whether you are working on new construction or motorizing existing ventilators, Allen Exhaust Fans will be the top-performance, quality answer to the particular ventilating problem. Easy to install, economical to operate, these fans meet a wide range of needs. In addition to the Fan Section shown above, the line includes the Remote Drive Allen Staxauster, and for wall installations, the Allen Exhaust Fan and the Lo-Noiz-Level Multiblade Fan. Our representatives are in most principal cities; names listed in our catalog in Sweet's Architectural File, Section 20b.

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Roof Ventilators for Every Commercial and Industrial Need

MEETINGS & CONVENTIONS

Continued

limited to invitation only. ASME headquarters, 29 W. 39th St., New York.

APR. 18-20—*3rd National Air Pollution Symposium.* Huntington-Sheraton Hotel, Pasadena, Calif. Headquarters: Stanford Research Institute, 727 W. 7th St., Los Angeles.

MAY 10-13—*Heating, Piping and Air Conditioning Contractors National Association,* 66th annual meeting. Shamrock Hotel, Houston, HPACCNA, 30 Rockefeller Plaza, New York 20.

MAY 12-14—*Automation—Engineering for Tomorrow.* An engineering symposium presented as part of the Centennial celebration of Michigan State College, East Lansing.

MAY 22-26—*Air Pollution Control Association,* 48th annual meeting. Detroit. Executive secretary: Harry C. Ballman, APCA, 4400 Fifth Ave., Pittsburgh 13.

MAY 23-26—*National District Heating Association,* 46th annual meeting. Edgewater Beach Hotel, Chicago. Write John F. Collins, Jr., secretary-treasurer, NDHA, 827 N. Euclid Ave., Pittsburgh.

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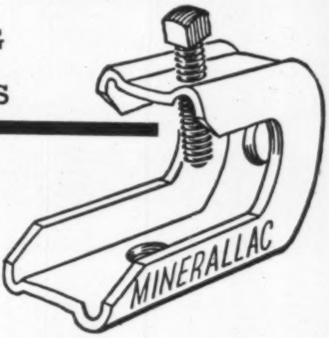

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electrostatic air filter

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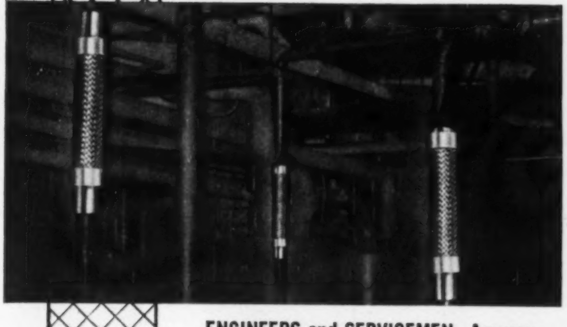

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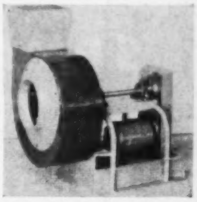

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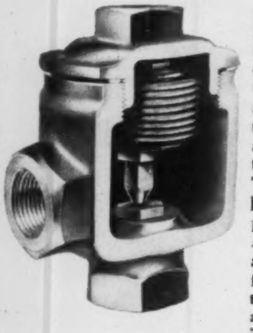
MAXIMUM

CAPACITY WITH MINIMUM MAINTENANCE

. . . . that's the big story on

STERLING THERMOSTATIC TRAPS



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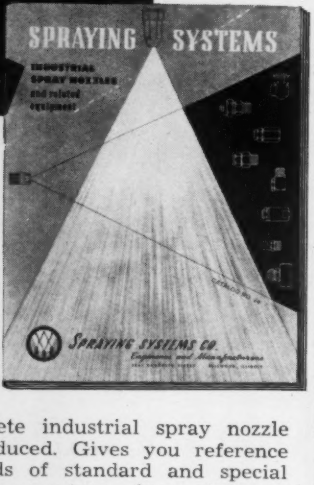
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MEETINGS & CONVENTIONS

Continued

JUNE 8-10—*American Welding Society*, 3rd annual show. Municipal Auditorium, Kansas City, Mo. The annual spring technical meeting is to run concurrently with the show, June 7-10. National secretary: Joseph G. Magrath, at the society, 33 W. 39th St., New York 18.

JUNE 12-15—*American Society of Refrigerating Engineers*, semiannual meeting. Milwaukee. ASRE headquarters, 40 W. 40th St., New York 18.

JUNE 27-29—*American Society of Heating and Air-Conditioning Engineers, Inc.*, semiannual meeting. St. Francis Hotel, San Francisco. ASHAE headquarters, 62 Worth St., New York 13.

NOV. 14-18—*Chicago Exposition of Power & Mechanical Engineering*. Coliseum, Chicago. The exposition is being held in conjunction with the 75th Anniversary Meeting of the American Society of Mechanical Engineers. Management: International Exposition Co., Inc., 480 Lexington Ave., New York 17.

NOV. 28-*DEC.* 1—*9th Exposition of the Air Conditioning and Refrigeration Industry*. Convention Hall, Atlantic City. The exposition is sponsored by the Air Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington, D. C.

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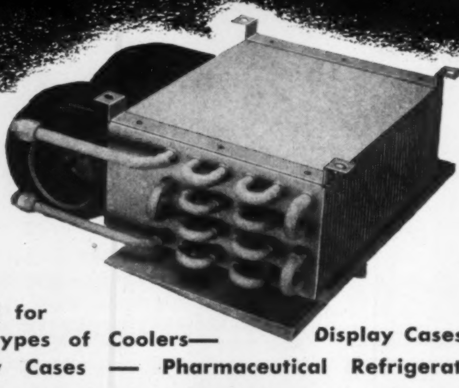
REMPE DOUBLE INLET BLOWER EVAPORATOR

FOR FRACTIONAL HORSEPOWER JOBS



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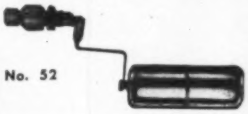
Only 5¾" long overall. Non-corrosive metals throughout. Easy to install by drilling one hole. Capacity ½ gal. per minute at 50 lbs. pressure.



No. 52

8" long overall. Same features as No. 51 Valve, except larger capacity—1 gal. per minute at 50 lbs. pressure.

QUICK HOOK-UP SADDLE VALVE

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Fits ½" and ¾" pipe. To install, just drill ¼" hole in pipe. Outlet provided for ¼" O.D. copper tubing.

HANDY NEEDLE VALVE

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Ideal to control water supply to humidifiers and water valves. ⅛" I.P. male end and ¼" O.D. copper tube size outlet.

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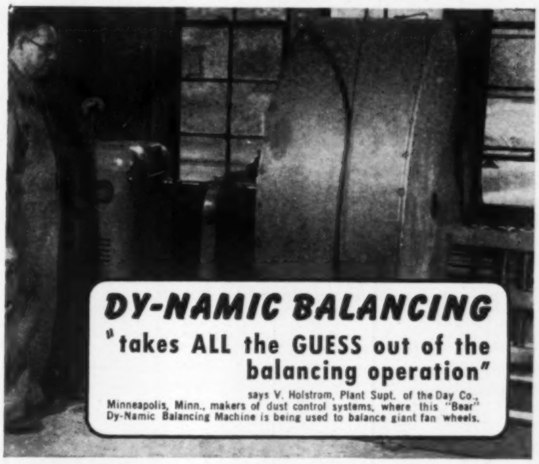

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STATIC AND *DY-NAMIC BALANCING* MACHINES
balance rotating parts weighing from 4 oz. to 8 tons

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PORTABLE
recorder
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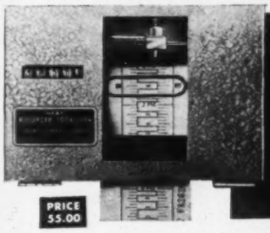

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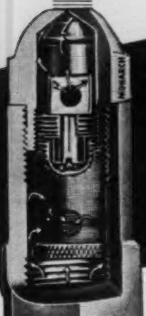

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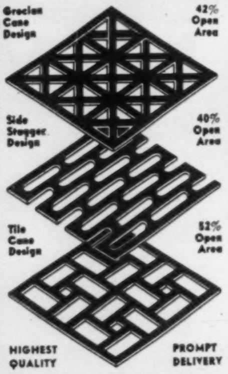
Send us your blueprints. We are equipped to fabricate special sections to any desired extent and welcome opportunities to make money-saving suggestions.



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DIMENSIONS AND TOLERANCES FOR FLEXIBLE STANDARD-WALL POLYETHYLENE PIPE—Commercial Standard CS197-54, U.S. Department of Commerce. Copies from Superintendent of Documents, U.S. Government Printing Office, Washington 25. 5c.

WHAT YOU SHOULD KNOW ABOUT MODERN STEAM HEATING—16 pp. Steam Heating Equipment Manufacturers Association, 450 E. Ohio St., Chicago 11. Free.

DIRECTORY OF COMMERCIAL AND COLLEGE TESTING LABORATORIES—48 pp. American Society for Testing Materials, 1916 Race St., Philadelphia 3. $1.00.

CONVERSION FACTORS AND TABLES—2nd Ed. By O. T. Zimmerman and Irvin Lavine. 525 pp. Industrial Research Service, Inc., Masonic Bldg., Dover, N.H. $5.00 ($5.50 outside the U.S.A.).

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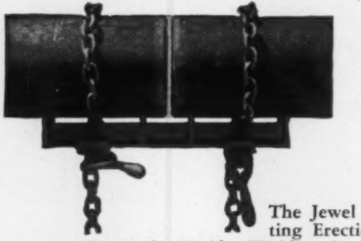

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INDUCED DRAFT SYSTEMS NEED SELECTED STARTING DRAFT!

CLEVELAND
DAMPER CONTROL
1
2

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Cleveland Damper Control provides the 4 Control Features essential to safe efficient operation of *Induced Draft Installations.*

1. STARTING DRAFT SELECTOR—providing pre-determined optimum draft for smooth, safe, ignition. When ignition is completed, damper control goes to full, automatic draft regulation.
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1111 Brookpark Road, Cleveland 9, Ohio
In Canada, write to: Ontor Laboratories Inc., 111 Tycos Drive, Toronto

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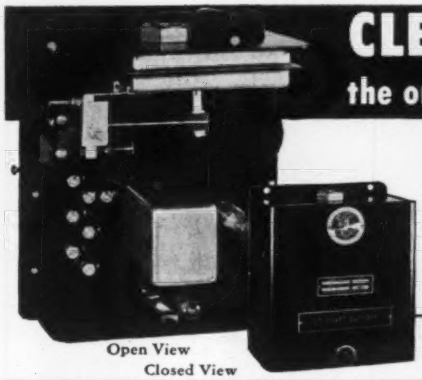

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the original "FAIL-SAFE" draft switch with TIME DELAY

CFE Lo-Draft Cut-Off is designed to prevent explosions or damage to boiler by automatically cutting off burner when draft fails, whether induced or natural. Cut-off point is adjustable over complete range. Models available for positive (pressure) or negative (draft) operation.

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situations wanted . . .

MECHANICAL ENGINEER — age 37, graduate, 16 years experience design, estimating and supervision of steam and process piping, heating, ventilating, material handling, mechanical equipment, general construction. Seeking responsible relocation, prefer Florida. Address Key 1045A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Ill.

Position Wanted — Mechanical Engineer, M.S., P.E., desires to make position change in the Metropolitan New York area. Experience consists of over five years in the Steam Power field including the design, testing, selection and evaluation of equipment but would like to broaden background in the Air Conditioning and Refrigeration field. Only responsible position will be considered. Address Key 1146A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Ill.

agents wanted . . .

Well known Eastern manufacturer of quality commercial finned-pipe and residential baseboard radiators desires to expand distributional outlets. To the established representative, it presents a fine opportunity to represent an extensive line of products, competitively priced. Areas available — South, Midwest, West and some eastern territories currently represented by our own salesmen. State extent of coverage, type of trade, lines presently handled. Address Key 1144A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Illinois.

Manufacturer's Agent Wanted. Well known manufacturer of propeller fan blades desires manufacturer's representative with following among original equipment manufacturers of air conditioning, heating and ventilating products and related fields. Several areas open. Reply to key 1142A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Illinois.

MANUFACTURERS' AGENT WANTED—Manufacturer of well established, nationally advertised ceiling air diffuser has a few excellent territories available and is seeking a representative having fan, filters, and refrigeration equipment as related lines. This is a patented unit without competition and presents a fine opportunity for a qualified agent. Address Key 1122A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Illinois.

Manufacturer's Agents required by well known manufacturer of STEAM, GAS AND OIL FIRED UNIT HEATERS, HEATING AND VENTILATING UNITS, CONVECTOR RADIATORS. Territories open in several sections of the United States. Airtherm Manufacturing Company, 711 South Spring Avenue, St. Louis 10, Missouri.

. . . . are you looking around for items or personnel? A simple classified advertisement here will help quickly, at low cost.

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Additional equipment lines for industrial and power plant use wanted by manufacturers' representative for eastern half of Pennsylvania, southern half of New Jersey and state of Delaware. Address Key 1143A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Illinois.

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HEATING, PIPING & AIR CONDITIONING
6 N. Michigan Ave.,
CHICAGO 2, ILL.

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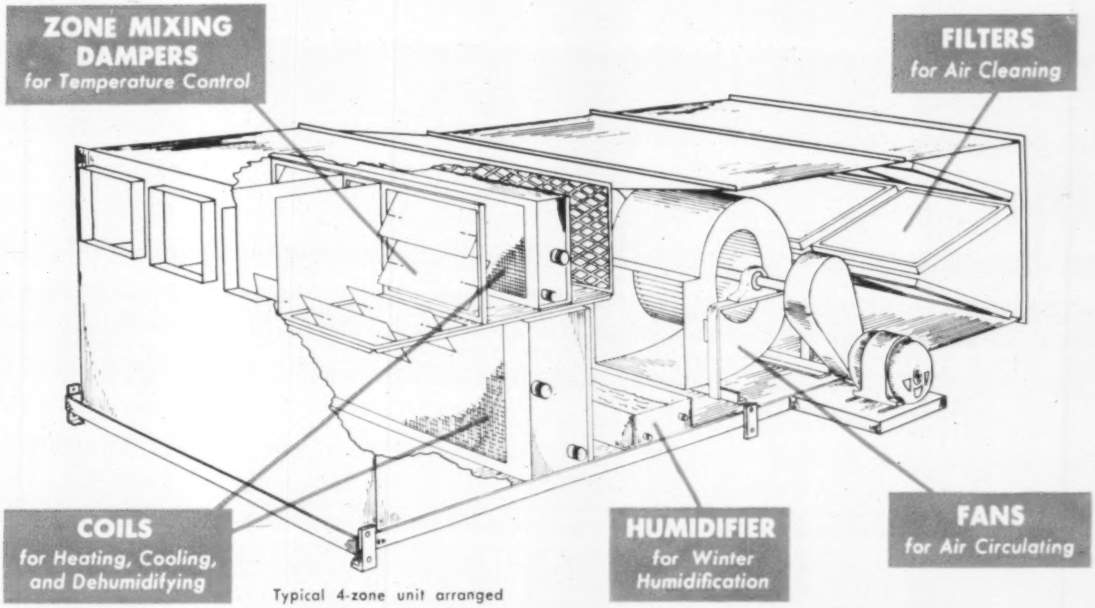
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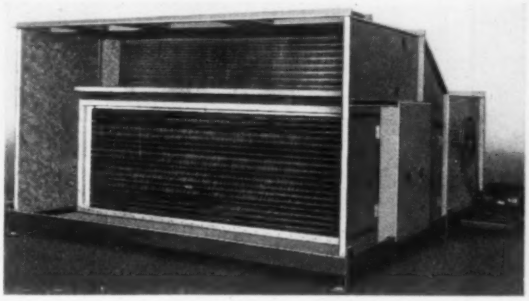

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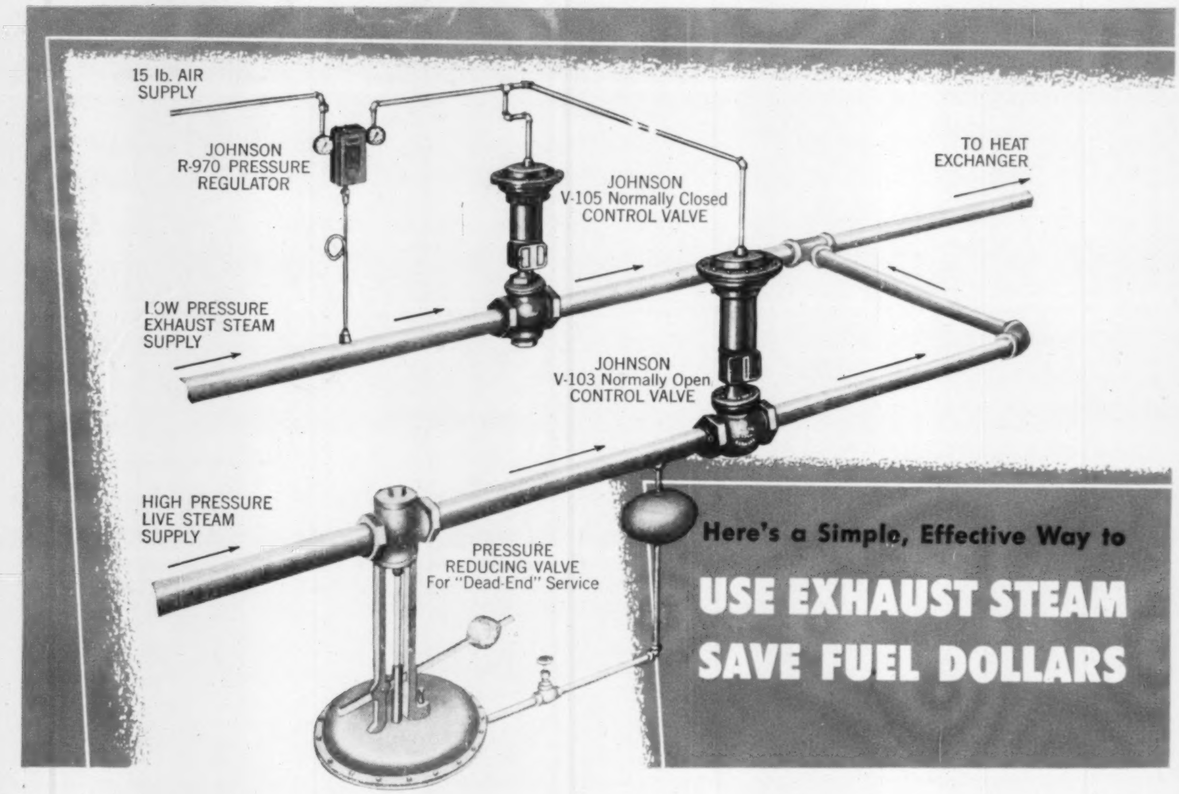
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